TGV-3E

SERVICE MANUAL

AEP Model
UK Model

VIDEO WALKMAN

- This is the exclusive tuner timer unit for the GV-S50E video cassette recorder.

SPECIFICATIONS

Tuner section

Channel coverage	VHF: E2–E12 UHF: 21–69 CATV: S01–S20
Aerial input	75-ohm minijack for VHF/UHF

Timer section

Clock	Crystal lock
Time indication	24-hour cycle
Timer setting	Only for recording, 6 events/month

General

Power requirements	Power is supplied from the GV-S50E video recorder/monitor.
Power consumption	1.5 W
Operating temperature	0°C to 40°C (32°F to 104°F)
Storage temperature	–20°C to 60°C (–4°F to 140°F)
Dimensions	34.5 × 64.5 × 121.5 mm (w/h/d) ($1\ ^3/_8 \times 2\ ^5/_8 \times 4\ ^7/_8$ inches)
Mass	Approx. 170 g (6 oz)
Accessories supplied	Signal splitter (1) Lithium battery CR2032 (1) Connecting cord (1)

Design and specifications are subject to change without notice.

Note
This appliance conforms with EEC Directive 87/308/EEC regarding interference suppression.

MICROFILM

TUNER TIMER UNIT

SONY®

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SAFETY CHECK-OUT

After correcting the original service problem, perform the following safety checks before releasing the set to the customer:

1. Check the area of your repair for unsoldered or poorly-soldered connections. Check the entire board surface for solder splashes and bridges.
2. Check the interboard wiring to ensure that no wires are "pinched" or contact high-wattage resistors.
3. Look for unauthorized replacement parts, particularly transistors, that were installed during a previous repair. Point them out to the customer and recommend their replacement.
4. Look for parts which, though functioning, show obvious signs of deterioration. Point them out to the customer and recommend their replacement.
5. Check the B+ voltage to see it is at the values specified.

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY MARK ⚠ OR DOTTED LINE WITH MARK ⚠ ON THE SCHEMATIC DIAGRAMS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY.

SECTION 1
GENERAL

This section is extracted from instruction manual.

WARNING

To prevent fire or shock hazard, do not expose the unit to rain or moisture.

To avoid electrical shock, do not open the cabinet. Refer servicing to qualified personnel only.

Television programmes, films, video tapes and other materials may be copyrighted. Unauthorized recording of such material may be contrary to provisions of the copyright laws.

Precautions

Operation

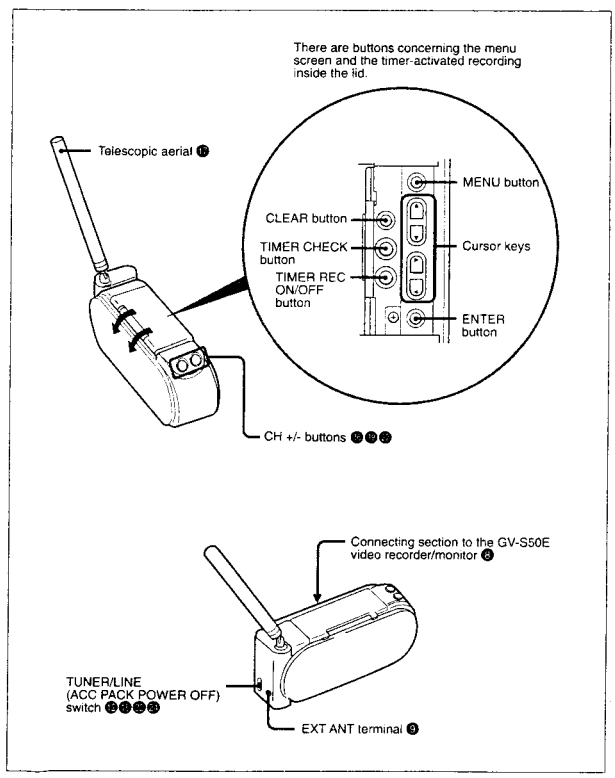
- Should any solid object or liquid fall into the cabinet, unplug the unit and have it checked by qualified personnel before operating it any further.
- Avoid rough handling or mechanical shock to the unit.
- Do not wrap up the unit and operate it because heat may build up internally.
- Avoid using and storing the unit in the following locations:
  - susceptible to vibration
  - exposed to strong magnetic fields
  - near TV or radio transmitters where strong radio waves are generated
  - on the sand

Care

- Clean the unit body with a dry, soft cloth, or a soft cloth lightly moistened with a mild detergent solution. Do not use any type of solvent which may damage the finish.

Location of Parts and Controls

For details, refer to the pages indicated in ●.


There are buttons concerning the menu screen and the timer-activated recording inside the lid.
Telescopic aerial ⓯
MENU button
CLEAR button
TIMER CHECK button
TIMER REC ON/OFF button
Cursor keys
ENTER button
CH +/- buttons ⓬⓭⓮
Connecting section to the GV-S50E video recorder/monitor ⓰
TUNER/LINE (ACC PACK POWER OFF) switch ⓫⓬⓭⓮
EXT ANT terminal ⓱

Preliminary

Overview of the TGV-3E

The TGV-3E is a tuner timer unit designed to be used with the GV-S50E 8mm video recorder/monitor.

By connecting the GV-S50E 8mm video recorder/monitor
- You can watch TV programmes. (page 16)
- You can record TV programmes. (page 22)

Features

- **Easy-to-use menu screen function**
- **Timer-activated recording**
- **SLEEP TIMER for turning off the unit automatically**

Menu Screen

The TGV-3E is equipped with a menu screen function. You can perform certain operations on the menu screen.
The TUNER MENU appears on the screen of the GV-S50E 8mm video recorder/monitor when you press MENU. Select the desired item on the TUNER MENU screen. For more details, see reference pages in the table below.

Menu screen

Menu item	Setting purpose	Reference page
TIMER SET	To preset timer-activated recordings	24
SLEEP TIMER	To turn off the unit automatically after a certain time	20
CHANNEL	To determine how to get a channel (DIRECT or SEEK)	18
CLOCK SET	To set the date and the time	10
TUNER PRESET	To preset TV channels	12

Note
The TUNER MENU does not appear while recording or playing back a tape on the GV-S50E video recorder/monitor.

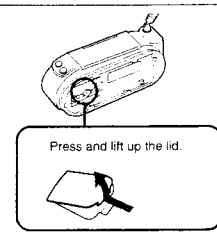
Getting Started

Power Sources

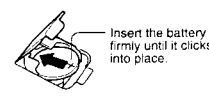
The TGV-3E automatically turns on and off when the GV-S50E video recorder/monitor turns on and off. The power for this unit is supplied from the GV-S50E video recorder/monitor. You do not have to connect any power source to the TGV-3E itself except a lithium battery which powers the clock and keeps the last channel in memory when the GV-S50E video recorder/monitor turns off.

Installing a Lithium Battery

1 Open the lid of the lithium battery compartment.



2 Install the supplied CR2032 lithium battery with the + side facing out.



3 Close the lid.

To remove the lithium battery
Push the battery forward and remove it as illustrated.

Lithium battery life

Approximately one year in normal operation.
If the lithium battery becomes weak, the message "CLOCK SET" appears when you select the TIMER SET menu. But even though you select the CLOCK SET menu, the "0:00" indication appears and the clock does not operate.
In this case, replace the battery with a Sony CR2032 lithium battery. Use of another battery may present a risk of fire or explosion. After replacing the battery, readjust the clock.

Cautions

- Keep the lithium battery out of the reach of children. Should the battery be swallowed, consult a doctor immediately.
- Before use, wipe the battery with a dry cloth to assure a good contact.
- Be sure to observe the correct polarity when installing the battery.
- Do not hold the battery with metallic tweezers, as that may cause short-circuit.
- Do not break up the battery or throw it into a fire because it may explode. Carefully dispose of the used batteries.

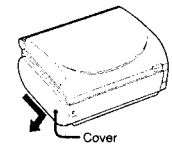
Warning

Battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire.

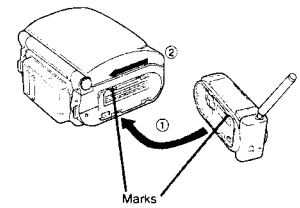
Connecting the GV-S50E Video Recorder/Monitor

Attaching the GV-S50E Video Recorder/Monitor

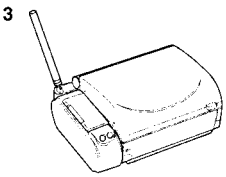
1 **Remove the cover while sliding the RELEASE lever in the direction of the arrow (←).**



2 **Align the marks of the connecting sections of this unit and the GV-S50E as illustrated (①), then slide this unit backward until it clicks (②).**



3

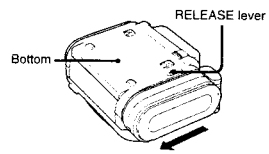


Note

When this unit is not connected to the GV-S50E, be sure to attach the cover to the connecting section of the GV-S50E to prevent damage.

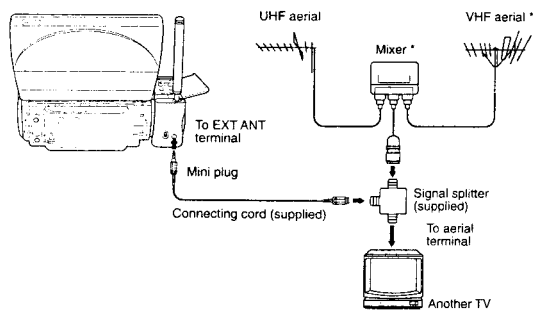
To remove the GV-S50E video recorder/monitor

Pull this unit forward while sliding the RELEASE lever in the direction of the arrow (←).



Connecting an Outdoor Aerial

If you cannot obtain satisfactory reception with the telescopic aerial, or when recording TV programmes, use an outdoor aerial.



* The mixer and the VHF aerial are not necessary in the United Kingdom as only UHF is available.

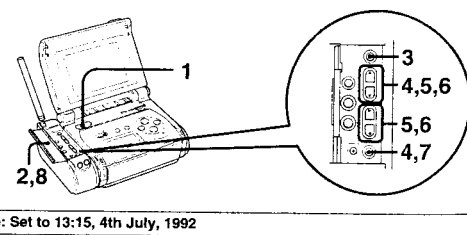
Setting the Clock

Before setting

Check the following points:

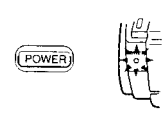
- Is the lithium battery installed correctly? (page 6)
- Is this unit connected to the GV-S50E video recorder/monitor? (page 8)
- Is the TUNER/LINE switch set to TUNER?

The built-in clock of this unit uses the 24-hour system.
0:00 stands for midnight.

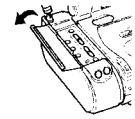


Example: Set to 13:15, 4th July, 1992

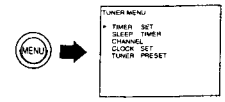
1 **Press POWER of the GV-S50E video recorder/monitor.**
This unit turns on simultaneously.
The POWER lamp on the front panel of the GV-S50E lights up.



2 **Open the lid.**

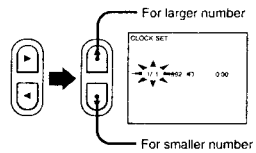


3 **Press MENU.**
The TUNER MENU display appears on the screen of the GV-S50E.



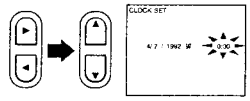
4 **Press ▲ or ▼ of the cursor keys to move the cursor (▶) down to CLOCK SET, and press ENTER.**

5 **Set the day, month, and year in this order.**
Press ◀ or ▶ to make the item to be set flash, and press ▲ or ▼ until the desired number appears.



- The day of the week is automatically displayed.
- This unit incorporates the calendar until the year 2007.

6 **Set the hour and minute.**
Press ◀ or ▶ to make the item to be set flash, and press ▲ or ▼ until the desired number appears.



7 **Press ENTER.**
The clock starts and the normal screen resumes.

8 **Close the lid.**

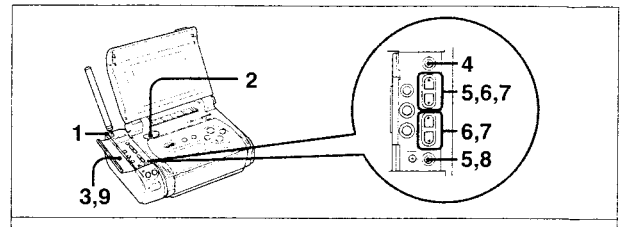
To reset the clock
Repeat steps 3 to 7.

Note
If the lithium battery is not installed, the clock will be reset each time you disconnect the GV-S50E from this unit.

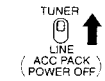
Presetting TV Channels

Presetting Channels

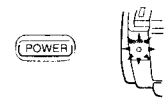
This unit is capable of receiving VHF channels E2–E12, UHF channels 21–69, and CATV channels S01–S20. Up to 60 channels can be allocated to any desired programme position.



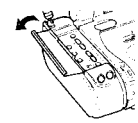
1 **Set the TUNER/LINE switch on the rear of this unit to TUNER.**



2 **Press POWER of the GV-S50E video recorder/monitor.**
This unit turns on simultaneously.
The POWER lamp on the front panel of the GV-S50E lights up.

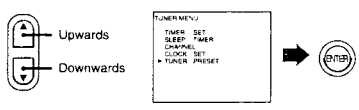


3 **Open the lid.**

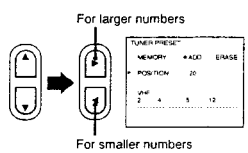


4 **Press MENU.**
The TUNER MENU display appears on the screen of the GV-S50E.

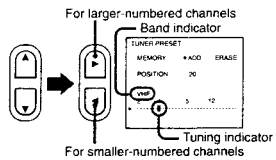
5 **Press ▲ or ▼ of the cursor keys to move the cursor (▶) down to TUNER PRESET, and press ENTER.**



6 **Press ▲ or ▼ of the cursor keys to move the cursor (▶) down to POSITION, and press ◀ or ▶ to select the desired programme position where the channel is to be stored.**



7 **Press ▲ or ▼ of the cursor keys to move the cursor (▶) down to the channel range display, and press ◀ or ▶ repeatedly until you get the desired channel.**
The UHF channel range is displayed after the VHF range.*
Repeat steps 6 and 7 for other channels to be preset.



8 **Press ENTER.**
Channel presetting is compieted. The on-screen display disappears.

9 **Close the lid.**

* After the channel range is displayed, wait for about two seconds before next operation.

Presetting TV Channels

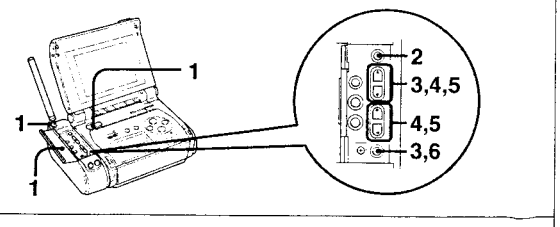
Programme scanning on the GV-S50E video recorder/monitor
When you press ▶ of the cursor keys on step 7, the channels are scanned in the following order.
When you press ◀, the scanning order is reversed.

VHF (E2–E4) ➡ CATV (S01–S10) ➡ VHF (E5–E12) ➡ CATV (S11–S20) ➡ UHF (21–69)

To change the order of the channels to be stored
Follow the above steps.

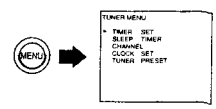
Erasing Programme Positions

The erased programme position is skipped when you press CH +/–.



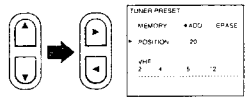
1 **Proceed steps 1 to 3 of "Presetting Channels" on page 12.**

2 **Press MENU.**
The TUNER MENU display appears on the screen of the GV-S50E.

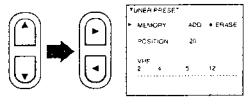


3 Press ▲ or ▼ of the cursor keys to move the cursor (▶) down to TUNER PRESET, and press ENTER.

4 Press ▲ or ▼ of the cursor keys to move the cursor (▶) down to POSITION, and press ◀ or ▶ to select the programme position to be skipped.



5 Press ▲ or ▼ of the cursor keys to move the cursor (▶) down to MEMORY, and press ◀ or ▶ to select ERASE.
Repeat steps 4 and 5 for other programme positions to be skipped.

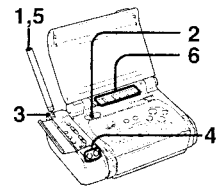


6 Press ENTER.
The on-screen display disappears.

To add the erased channels again
See "Presetting Channels" on page 12.

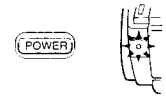
Watching TV Programmes

Viewing a Preset TV Programme

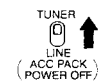


1 Pull out the telescopic aerial fully.
Be sure to pull out the base of the telescopic aerial.
If you have connected an external aerial or CATV cables, be sure to fold in the telescopic aerial.

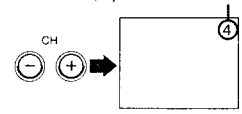
2 Press POWER of the GV-S50E video recorder/monitor.
This unit turns on simultaneously.
The POWER lamp on the front panel of the GV-S50E lights up.



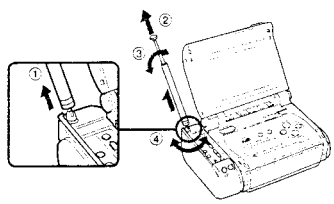
3 Set the TUNER/LINE switch to TUNER, if a TV programme is not displayed.



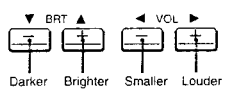
4 Select the desired programme.
Press CH + for higher-numbered programmes and CH – for lower-numbered programmes. The programmes appear in numerical sequence.
Press CH +/– repeatedly until you get the desired programme on the screen.



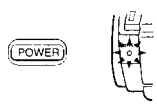
5 Adjust the telescopic aerial for the best reception.



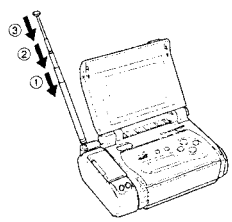
6 Adjust the volume and brightness.
Press BRT +/– and VOL +/– on the GV-S50E video recorder/monitor.



To turn off the TV
Press POWER of the GV-S50E video recorder/monitor.
The POWER lamp on the front panel of the GV-S50E goes out.



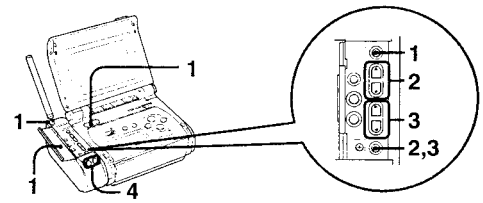
To pull the telescopic aerial away
Slide in the base of the telescopic aerial first, then the centre and the point.



Watching TV Programmes

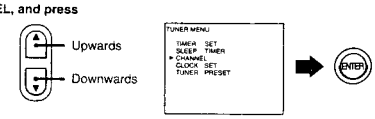
Viewing a TV Programme Without Presetting Channels

When you do not know the channel number of the TV programme you wish to view or if you want to use this unit in a moving car, search for the programme as follows.



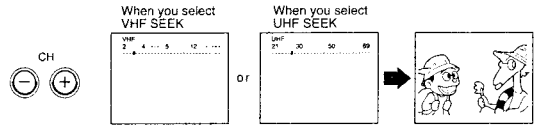
1 Proceed steps 1 to 4 of "Presetting Channels" on page 12.

2 Press ▲ or ▼ of the cursor keys to move the cursor (▶) down to CHANNEL, and press ENTER.



3 Press ◀ or ▶ of the cursor keys to select VHF SEEK or UHF SEEK, and press ENTER.

4 Press CH +/– buttons to select the channel.
Press the buttons repeatedly until you get the desired programme on the screen.



After selecting the channel, the channel range display goes out after a few seconds.

"Last channel" memory function

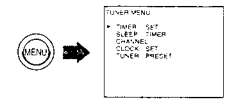
- While you are watching TV programmes, if the power source is disconnected or the battery pack becomes exhausted, the unit turns off with the last channel being memorized.
  When you turn on the unit again, the last channel appears on the screen. The lithium battery must be installed for this function.
- The last channel memory function also works when the TV signal is cut off, for example, when you go through a tunnel in a moving car.
- If the lithium battery becomes exhausted but the power source is connected, the last channel memory function will still operate.

Using the SLEEP TIMER

You can set the unit to turn off automatically after a certain amount of time, after as short as 30 minutes or as long as 5 hours, while viewing a TV programme, tape playback, or while recording.

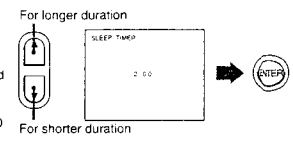
Example: To turn off the TV after 2 hours

1 Press MENU.
The TUNER MENU display appears on the screen of the GV-S50E.



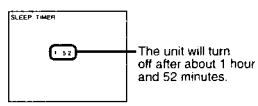
2 Press ▲ or ▼ of the cursor keys to move the cursor (▶) down to SLEEP TIMER, and press ENTER.

3 Press ▲ or ▼ of the cursor keys to select the desired time interval, and press ENTER.
The TV will be turned off automatically after 2 hours.
The procedure is the same for tape playback and recording. The tape will stop running after the selected time interval.
The interval changes up to 5 hours in steps of 30 minutes.



To cancel the SLEEP TIMER
Press POWER of the GV-S50E to turn off the power of the video recorder/monitor.
(Even while playing back or recording a tape, you can cancel the SLEEP TIMER by turning off the power of the video recorder/monitor.)

To check the remaining time
Select SLEEP TIMER in the TUNER MENU display, and press ENTER.
The remaining time is displayed.
(You cannot check the remaining time while playback or recording a tape.)

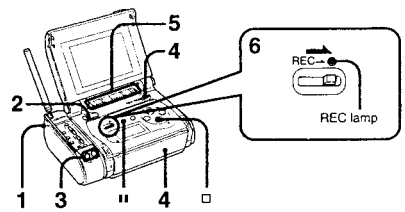


Note
When you use the unit with rechargeable batteries on the GV-S50E, the unit may turn off before the selected time because the batteries are exhausted.

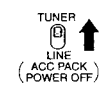
Recording TV Programmes

Recording TV Programmes

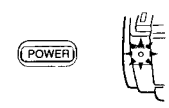
You can record a TV programme while viewing it. For better picture and sound quality, connecting an external aerial is recommended.



1 Set the TUNER/LINE switch on the rear of this unit to TUNER.



2 Press POWER of the GV-S50E video recorder/monitor.
This unit turns on simultaneously.
The POWER lamp on the front panel of the GV-S50E lights up.



3 Select the desired TV channel.

4 Insert a cassette.

5 Select the recording mode, SP or LP.
Refer to the operating instructions supplied with the GV-S50E video recorder/monitor.
The recording time of a cassette in the LP mode is twice as long as that in the SP mode. For better picture and sound quality, select the SP mode.

6 **Slide REC to the right.**
The REC lamp lights and the recording starts.

To stop recording for a moment
Press **II**.

To resume recording
Press **II** again. (If **II** is not pressed again for about 5 minutes, the pause mode will be released automatically and the GV-S50E will stop. This is to protect the video heads.)

To stop recording
Press □.

When the tape is recorded to the end
The tape stops automatically, but the unit is not turned off. If you are not going to continue operation, turn off the power of the GV-S50E.

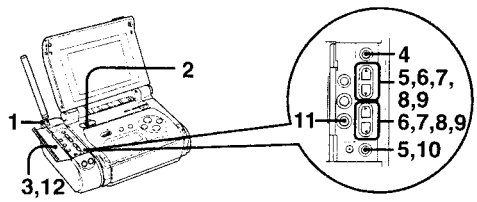
About the recorded sound
The VOL control setting has no effect on the recording level.

To change the channel during recording
Set the unit in the recording pause mode and then select another channel. You cannot watch another programme while recording.

Timer-Activated Recording

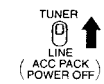
By using the timer-activated recording feature, you can preset the GV-S50E to record up to six TV programmes within a one-month period.
For better picture and sound quality, connecting an external aerial is recommended.

Before setting the timer
- Is the GV-S50E correctly connected to this unit? (See page 8.)
- Make sure that the power is supplied. (Is the battery pack on the GV-S50E fully charged? For long recording, use of the AC power source is recommended.)
- Set the clock correctly. (See page 10.) If the clock is not set, the message "CLOCK SET" appears on the screen.
- Insert a tape correctly. Make sure that the safety tab is slid in. (Refer to the operating instructions of the GV-S50E.)

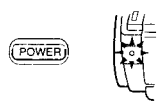


Example: To record a broadcast on programme position 6, from 20:00 to 20:45 on Saturday, 4th July 1992, in SP mode

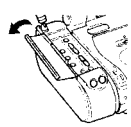
1 **Set the TUNER/LINE switch on the rear of this unit to TUNER.**



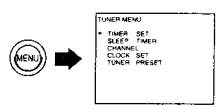
2 **Press POWER of the GV-S50E video recorder/monitor.**
This unit turns on simultaneously.
The POWER lamp on the front panel of the GV-S50E lights up.



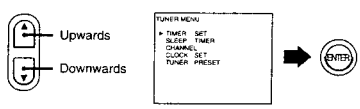
3 **Open the lid.**



4 **Press MENU.**
The TUNER MENU display appears on the screen of the GV-S50E.

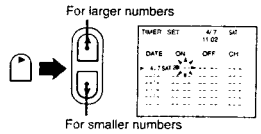


5 **Press ▲ or ▼ of the cursor keys to move the cursor (▶) down to TIMER SET, and press ENTER.**



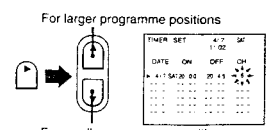
6 **Set the date, starting time, and ending time.**
Press ▶ of the cursor keys to make the item to be changed flash, and press ▲ or ▼ until the desired date or time appears.

To change an item which is already set
Press ◀ or ▶ of the cursor keys to make the item to be changed flash, and press ▲ or ▼ to change it.

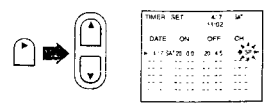


Timer-Activated Recording

7 **Select the programme to be recorded.**
Press ▲ or ▼ until the desired programme position appears.



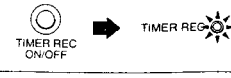
8 **Select the tape speed.**
Press ▲ or ▼ to select SP or LP.



9 **Press ▶ to store the setting.**
If you want preset another programme, press ▼ to move the cursor (▶) to the next line and repeat steps 6 to 9.

10 **Press ENTER, or make sure that the cursor (▶) is at the beginning of a line.**

11 **Press TIMER REC ON/OFF.**
The TIMER REC lamp lights up and the GV-S50E turns off.

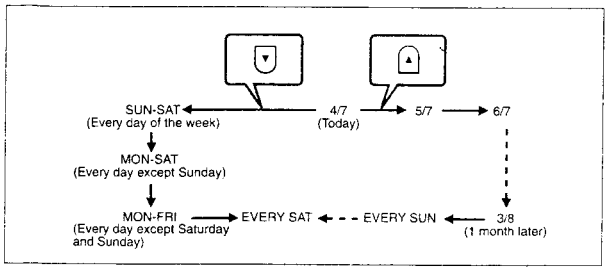


12 **Close the lid of this unit and the LCD of the GV-S50E.**
The recording starts automatically at the preset starting time and the power goes off at the preset ending time.

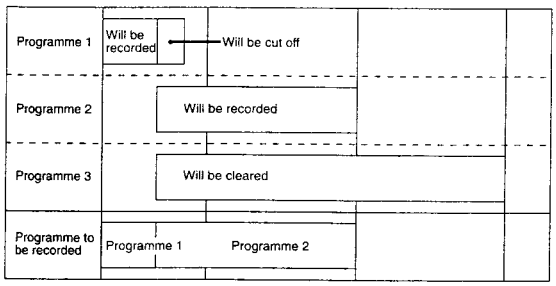
To stop the timer recording
Press the TIMER REC ON/OFF again.
The TIMER REC lamp goes out and the tape stops.

Every Week Recording and Every Day Recording

You can preset to record the same programme every day or the same programme on a specific day of every week.
When you set the date, press ▲ or ▼, and the indication will change as follows:
For every week recording or every day recording, press ▼ to set the date quickly.



When the presettings of timer recordings overlap
Example



Programme 1: The recording will stop before the programme finishes.
Programme 2: The programme will be recorded completely.
Programme 3: The presetting will be cancelled.

Timer-Activated Recording

- **If the starting time of one programme comes before the recording of the other programme is finished**
  The recording of programme 2 begins before programme 1 is finished.
- **If the starting time of two programmes are the same**
  The programme which is preset on the upper line in the TIMER SET display will be recorded and the other programme will be cancelled.

Note
If the starting time of the second programme is the same as the ending time of the first programme, the last 20 seconds of the first programme will not be recorded.

While playing back or recording a tape
You cannot set the timer. Set the timer after stopping the tape.

During timer recording standby mode
No buttons other than TIMER REC ON/OFF and TIMER CHECK are operable.

During timer recording
If you want to watch the picture, open the LCD.

To record to the end of the tape
Set the starting and ending time the same. When the tape reaches the end, recording will stop and the power goes off.

If you detach this unit from the video recorder/monitor during timer recording or timer recording standby mode
The timer settings will be cancelled even if you attach this unit to the video recorder/monitor again.

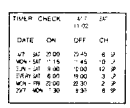
If a power interruption occurs or the power is disconnected when using the video recorder/monitor with the AC power source
- **During timer recording**
  Timer recording stops. Even if the power is resupplied, recording does not resume.
- **During timer recording standby mode**
  Even if the power is resupplied, the timer function does not work.
  Press TIMER REC ON/OFF again to resume the timer function.

Checking the Contents of Preset Timer Setting

When the unit is in timer recording standby mode or in stop mode
Press TIMER CHECK. The TIMER CHECK display showing the preset timer settings will appear on the screen. If the unit is turned off, turn on the unit, then press TIMER CHECK. The TIMER CHECK display will appear.

To turn off the TIMER CHECK display, press TIMER CHECK again.

TIMER CHECK



Note
You cannot check the contents of timer settings while the timer recording is being executed.

Changing the Timer Settings

When the unit is in timer recording standby mode

1 Release the timer recording standby mode by pressing TIMER REC ON/OFF.

2 Turn on the GV-S50E.

3 Preset timer again. (See the procedures on pages 24 to 26.)

Note
You cannot change the timer settings while the timer recording is being executed.

Cancelling the Timer Settings

Release the timer recording standby mode by pressing TIMER REC ON/OFF.
Turn on the GV-S50E and select TIMER SET in the TUNER MENU display. In the TIMER SET display, press ▲ or ▼ of the cursor keys to move the cursor (▶) to the setting to be cleared and press CLEAR. The setting will be cleared and "– / – – : – – – : – – – – –" indication resumes.

Operating the Unit After Setting the Timer

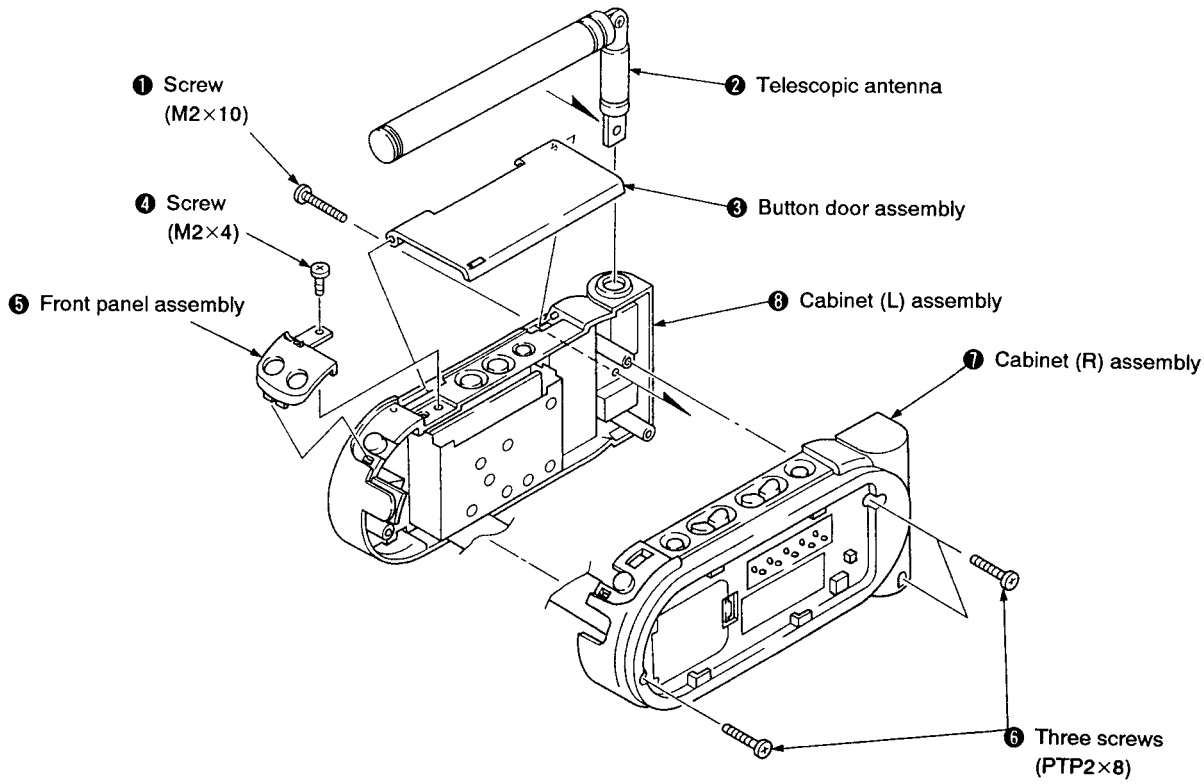
1 Press TIMER REC ON/OFF.
The TIMER REC lamp goes off.

2 Operate the unit.

3 After using it, press TIMER REC ON/OFF to turn on the TIMER REC lamp. The unit turns off and enters timer recording standby mode.

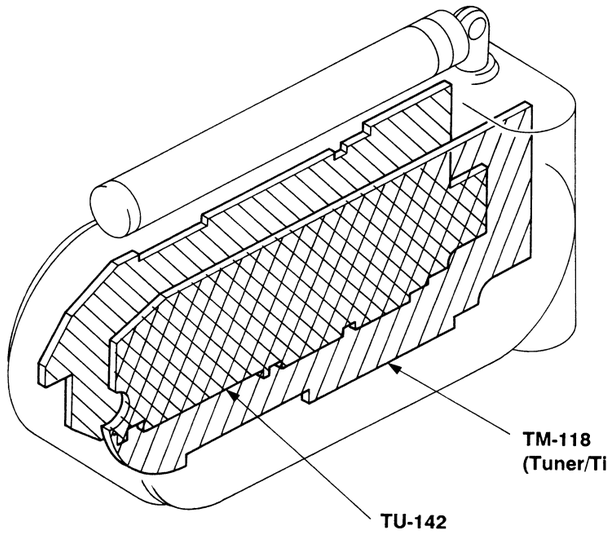
SECTION 2
DISASSEMBLY

2-1. REMOVAL OF TELESCOPIC ANTENNA AND CABINET (L, R) ASSEMBLIES

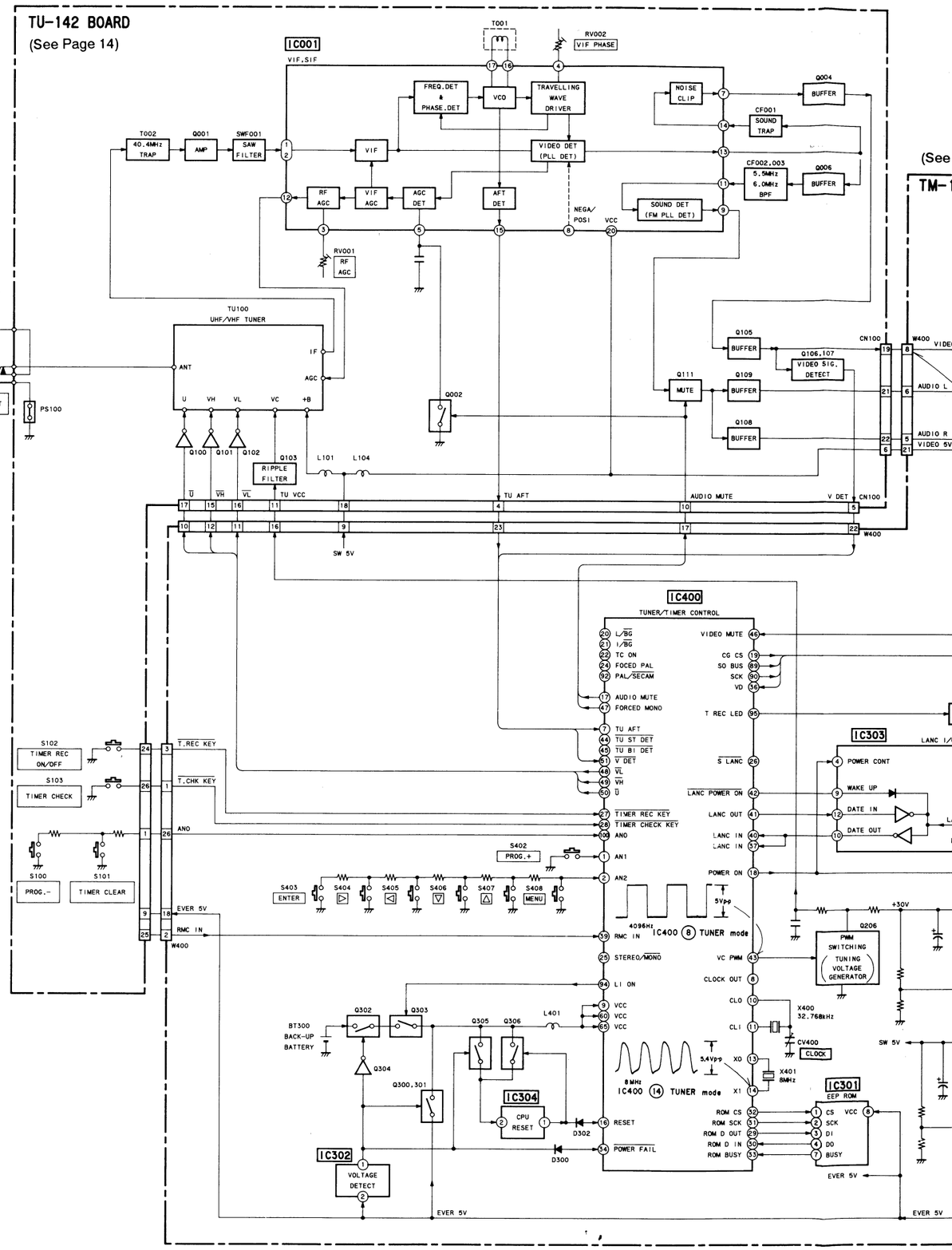


SECTION 3
DIAGRAMS

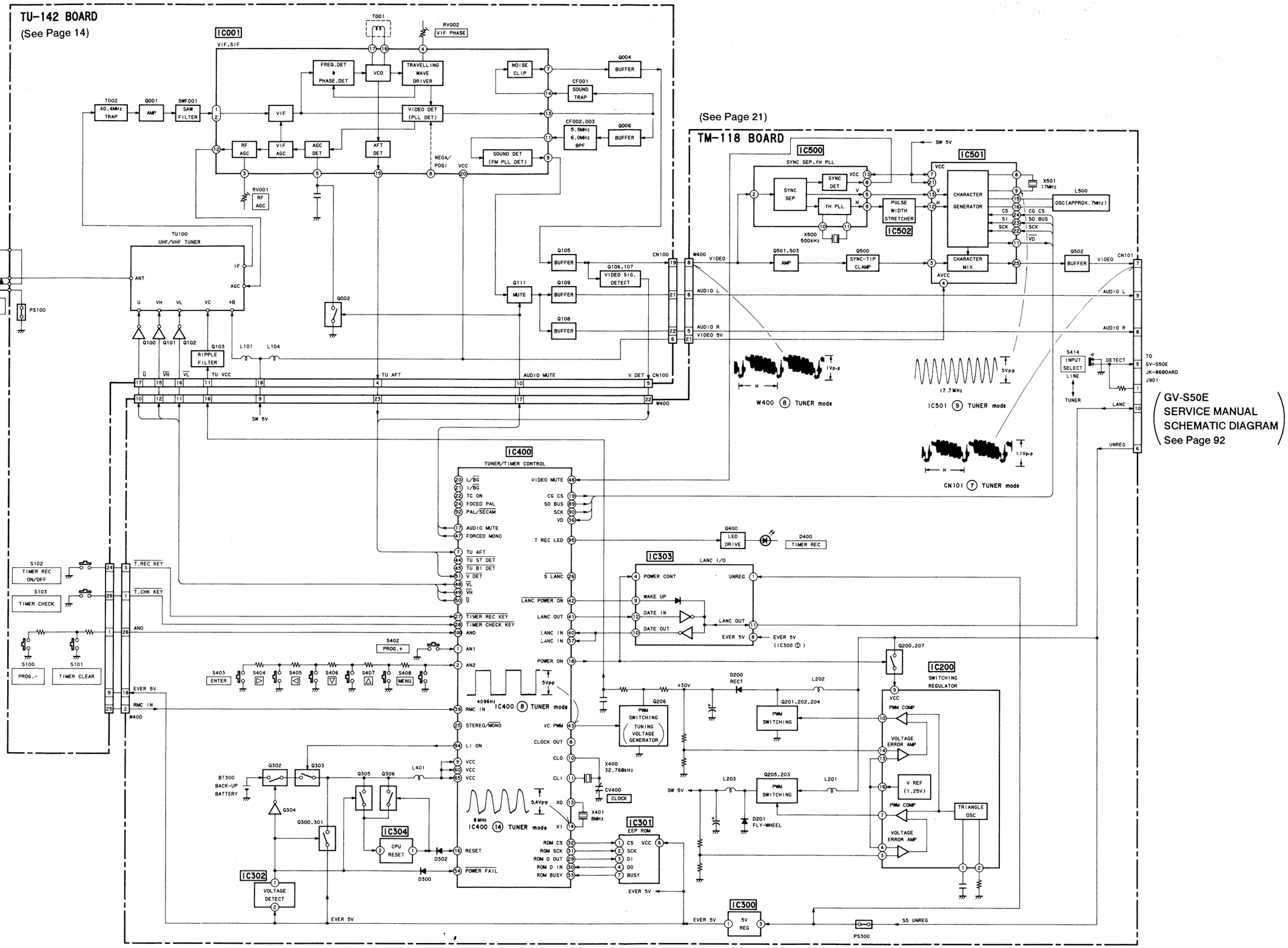
3-1. CIRCUIT BOARD LOCATION



3-2. TUNER/TIMER BLOCK DIAGRAM



3-2. TUNER/TIMER BLOCK DIAGRAM



SECTION 4
PRINTED WIRING BOARDS AND SCHEMATIC DIAGRAMS

4-1. PRINTED WIRING BOARDS AND SCHEMATIC DIAGRAMS

THIS NOTE IS COMMON FOR PRINTED WIRING BOARDS AND SCHEMATIC DIAGRAMS.
(In addition to this , the necessary note is printed in each block.)

- **For printed wiring boards.**
- ○ : Through hole
- ■ : Pattern from the side which enables seeing.
  (The other layer's patterns are not indicated.)
- Circled numbers refer to waveforms.

Caution:	
Pattern face side: (Conductor Side)	Parts on the pattern face side seen from the pattern face are indicated.
Parts face side: (Component side)	Parts on the parts face side seen from the parts face are indicated.

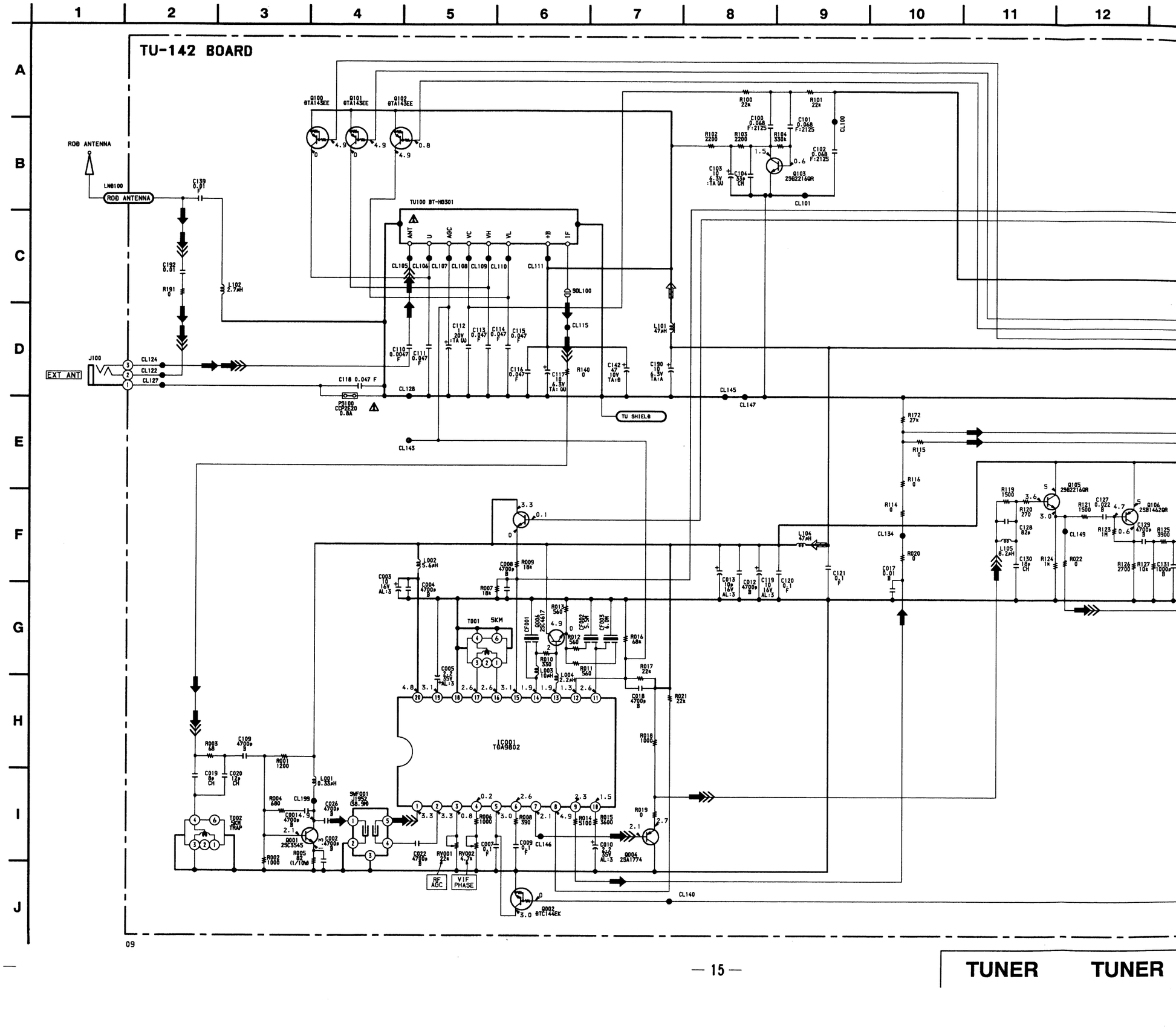
- **For schematic diagrams.**
- Caution when replacing chip parts.
  New parts must be attached after removal of chip.
  Be careful not to heat the minuts side of tantalum capacitor, because it is damaged by the heat.
- Chip resistor are 1/10W unless otherwise noted.
  kΩ : 1000Ω , MΩ : 1000kΩ .
- All capacitors are in μF unless otherwise noted. pF: μμF.
  50V or less are not indicated except for electrolytics and tantalums.
- All variable and adjustable resistors have characteristic curve B, unless otherwise noted.
- : nonflammable resistor.
- : fusible resistor.
- : panel designation.
- △ : internal component.
- : adjustment for repeair.
- ——— : B+ Line.
- - - - : B– Line.
- : IN/OUT direction of (+, –) B LINE.
- Circled numbers refer to waveforms.
- Voltages are dc between ground and measurement points.
- Readings are taken with a color-bar signal input.
- Readings are taken with a digital multimeter (DC10MΩ).
- Voltage variations may be noted due to normal production tolerances.

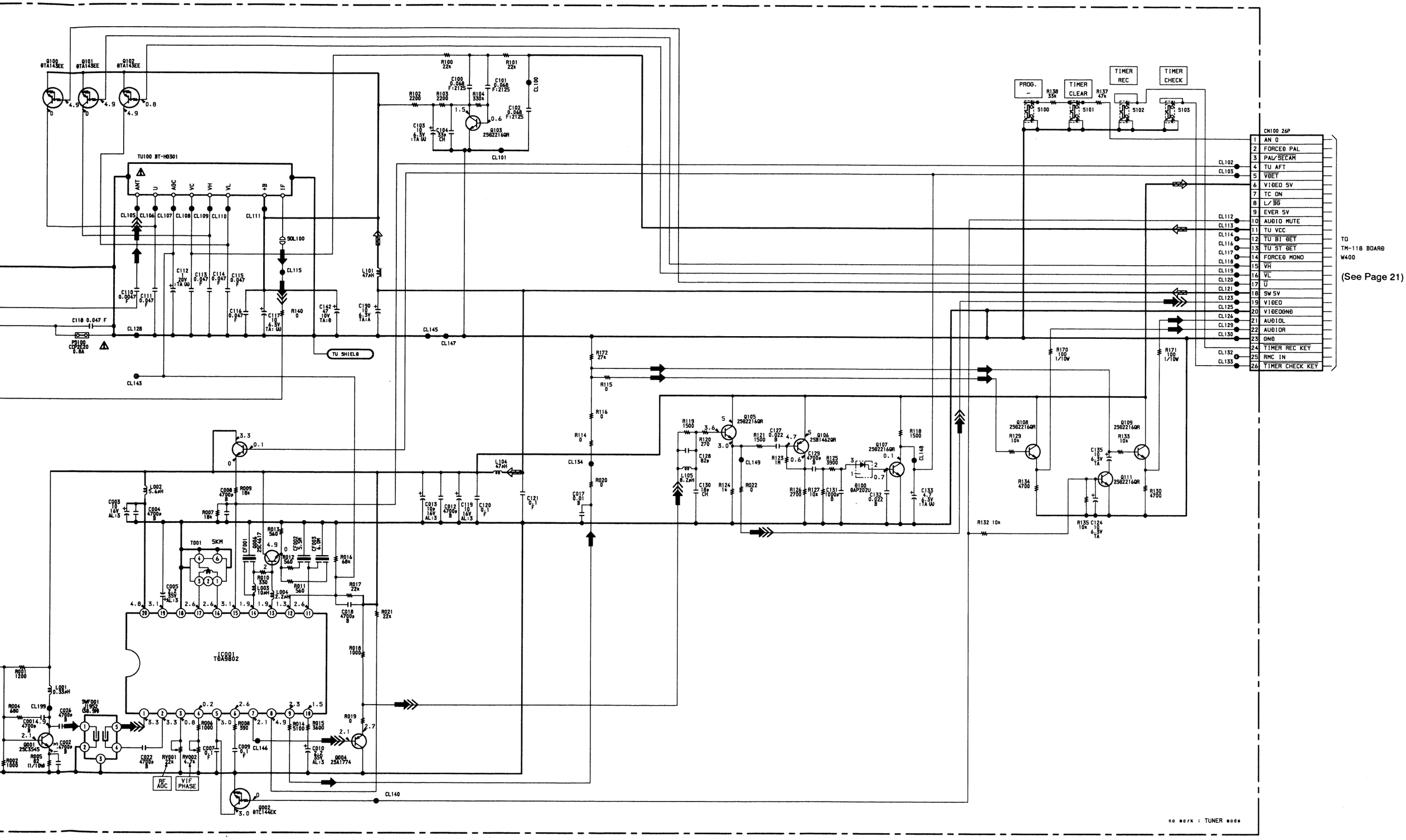
Note:
The components identi- fied by mark ⚠ or dotted line with mark ⚠ are critical for safty.
Replace only with part number specified.

- **SIGNAL PATH**

	VIDEO SIGNAL			AUDIO SIGNAL
	CHROMA	Y	Y/CHROMA	
REC			➡	➡
PB				

TU-142 (TUNER) SCHEMATIC DIAGRAM

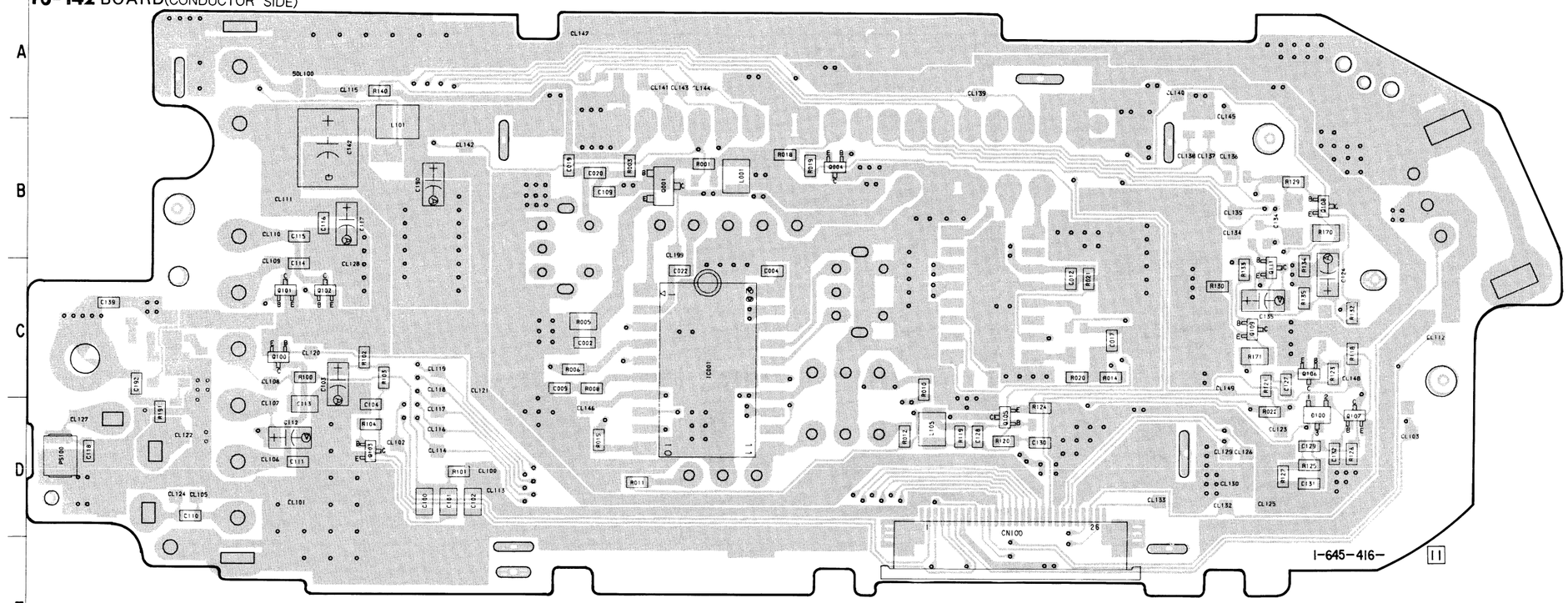




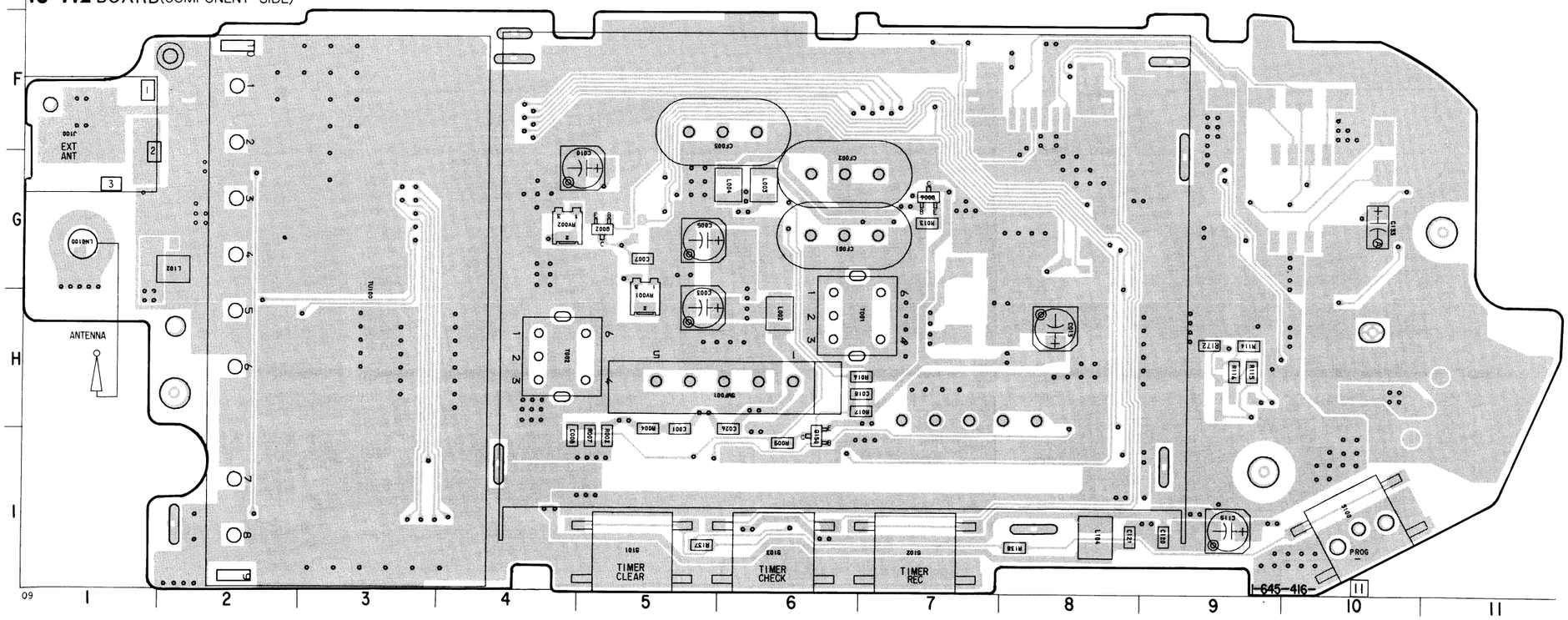
no mark : TUNER mode

TU-142 (TUNER) PRINTED WIRING BOARD

TU-142 BOARD(CONDUCTOR SIDE)



TU-142 BOARD(COMPONENT SIDE)



TU-142 BOARD

D100 D-10

Q001 B-5
Q002 G-5
Q004 B-6
Q006 G-7
Q100 C-2
Q102 C-3
Q103 D-3
Q105 D-7
Q106 C-10
Q107 D-10
Q108 B-10
Q109 C-9
Q111 B-9
Q150 I-6

〈 DIODE 〉

D100 8-719-941-09 DIODE DAP202U

〈 IC 〉

IC001 8-759-083-13 IC TDA9802T

〈 TRANSISTOR 〉

Q001 8-729-107-33 TRANSISTOR 2SC3545
Q002 8-729-928-81 TRANSISTOR DTC144EE
Q004 8-729-928-19 TRANSISTOR 2SA1774R
Q006 8-729-927-XX TRANSISTOR 2SC4617R
Q100 8-729-928-42 TRANSISTOR DTA143EE

Q101 8-729-928-42 TRANSISTOR DTA143EE
Q102 8-729-928-42 TRANSISTOR DTA143EE
Q103 8-729-425-64 TRANSISTOR 2SD2216Q
Q105 8-729-425-64 TRANSISTOR 2SD2216Q
Q106 8-729-425-50 TRANSISTOR 2SB1462Q

Q107 8-729-425-64 TRANSISTOR 2SD2216Q
Q108 8-729-425-64 TRANSISTOR 2SD2216Q
Q109 8-729-425-64 TRANSISTOR 2SD2216Q
Q111 8-729-425-64 TRANSISTOR 2SD2216Q
Q150 8-729-928-42 TRANSISTOR DTA143EE

TM-118 BOARD

D200	H-2	Q200	D-2
D201	B-2	Q201	B-2
D300	H-5	Q202	B-2
D301	I-5	Q203	H-2
D302	I-6	Q204	H-2
D400	F-9	Q205	H-2
D500	E-5	Q206	A-2
D501	E-4	Q207	D-2
D502	E-6	Q300	I-5
D503	E-6	Q301	H-5
D504	D-3	Q302	I-5
D510	B-10	Q303	I-5
		Q304	H-5
IC200	C-2	Q305	I-5
IC300	H-4	Q306	I-5
IC301	H-6	Q400	C-3
IC302	H-5	Q500	I-9
IC303	H-6	Q501	I-10
IC304	I-5	Q502	G-11
IC400	B-4	Q503	I-10
IC500	H-6		
IC501	G-8		
IC502	G-7		

〈 DIODE 〉

D200	8-719-802-36	DIODE 1SS250
D201	8-719-938-75	DIODE SB05-05CP
D300	8-719-941-09	DIODE DAP202U
⚠D301	8-719-421-27	DIODE MA728
D302	8-719-941-09	DIODE DAP202U
D400	8-719-800-56	LED TLUR164
D500	8-719-420-81	DIODE MA3075WA
D501	8-719-420-81	DIODE MA3075WA
D502	8-719-106-80	DIODE RD13M-B2
D503	8-719-106-80	DIODE RD13M-B2
D504	8-719-106-80	DIODE RD13M-B2
D510	8-719-420-81	DIODE MA3075WA

〈 IC 〉

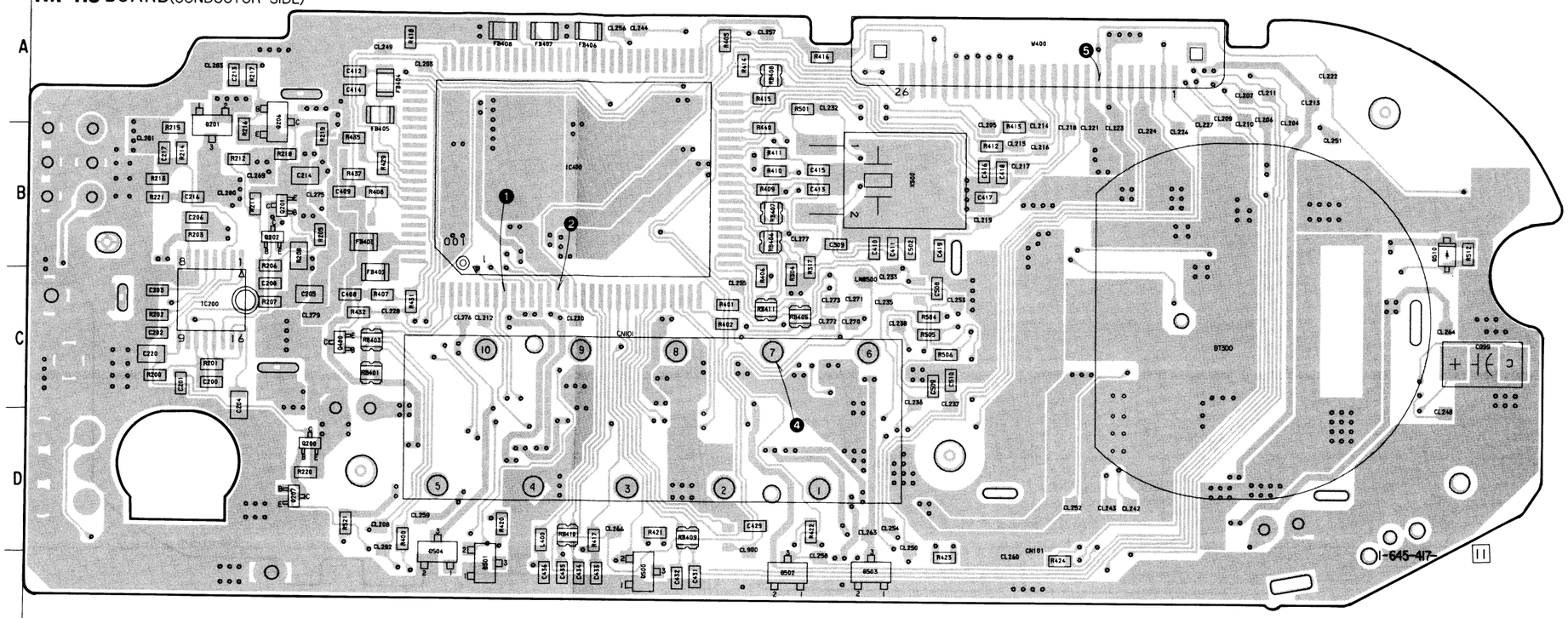
IC200	8-759-990-45	IC MB3775PFV
IC300	8-759-512-69	IC S-81350HG-KD
IC301	8-759-720-45	IC CAT35C202K
IC302	8-759-946-03	IC S-8054ALR-LN-S
IC303	8-759-999-02	IC TL1596CDB
IC304	8-759-940-33	IC S-8052ALO-LG-S
IC400	8-759-083-08	IC MB89794BPF-177
IC500	8-759-083-11	IC LA7217M
IC501	8-759-083-09	IC MB90075PF
IC502	8-759-209-97	IC TC4S81F

〈 TRANSISTOR 〉

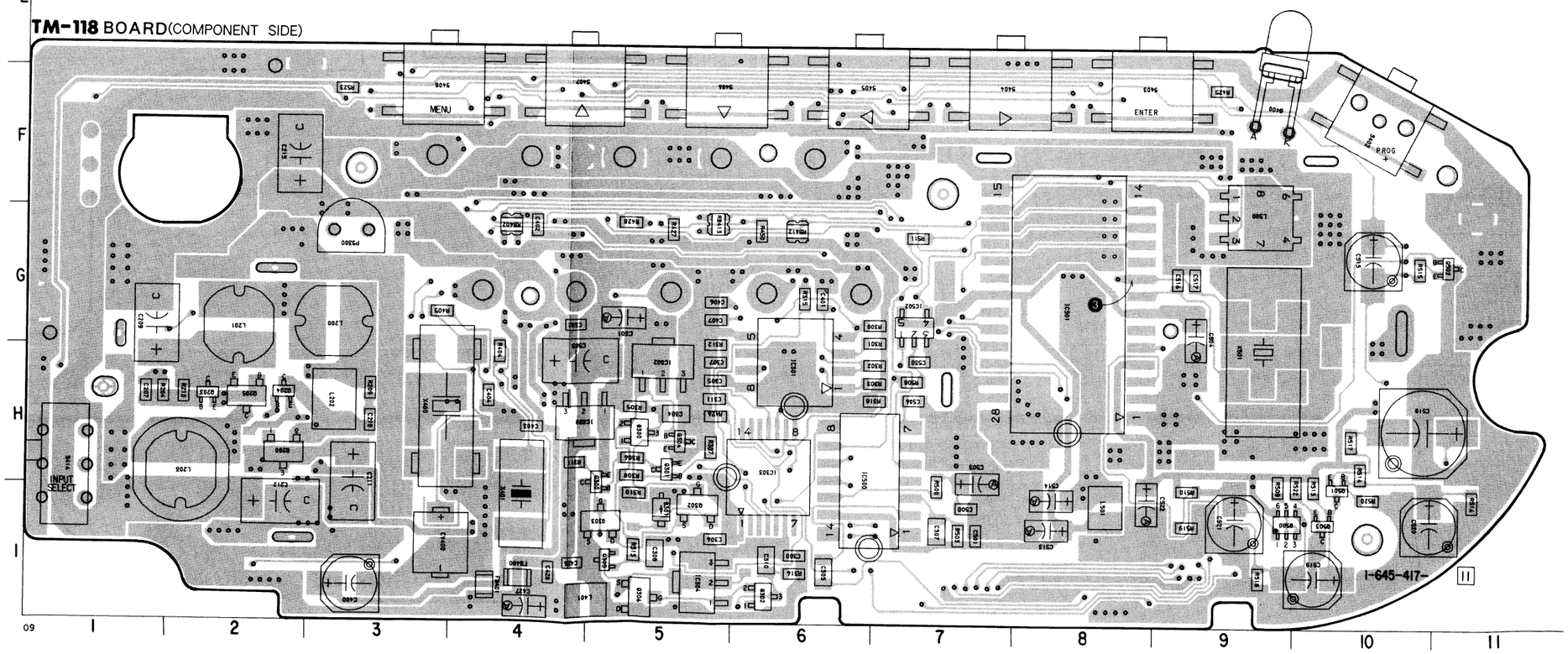
Q200	8-729-428-88	TRANSISTOR UN9113
Q201	8-729-425-64	TRANSISTOR 2SD2216Q
Q202	8-729-425-50	TRANSISTOR 2SB1462Q
Q203	8-729-425-64	TRANSISTOR 2SD2216Q
Q204	8-729-425-64	TRANSISTOR 2SD2216Q
Q205	8-729-141-48	TRANSISTOR 2SB624-BV345
Q206	8-729-601-58	TRANSISTOR 2SC3053-C
Q207	8-729-429-18	TRANSISTOR UN9213
Q300	8-729-425-50	TRANSISTOR 2SB1462Q
Q301	8-729-425-64	TRANSISTOR 2SD2216Q
⚠Q302	8-729-220-93	TRANSISTOR 2SK209-G
⚠Q303	8-729-220-93	TRANSISTOR 2SK209-G
Q304	8-729-429-18	TRANSISTOR UN9213
Q305	8-729-425-64	TRANSISTOR 2SD2216Q
Q306	8-729-220-93	TRANSISTOR 2SK209-G
Q400	8-729-929-26	TRANSISTOR DTC114TE
Q500	8-729-427-72	TRANSISTOR XP4501
Q501	8-729-425-64	TRANSISTOR 2SD2216Q
Q502	8-729-425-50	TRANSISTOR 2SB1462Q
Q503	8-729-425-50	TRANSISTOR 2SB1462Q

TM-118 (TIMER) PRINTED WIRING BOARD

TM-118 BOARD(CONDUCTOR SIDE)



TM-118 BOARD(COMPONENT SIDE)



TM-118 BOARD

W400

AN 0	26	CL228
FORCED PAL	25	CL900
PAL/SECAM	24	CL203
TU AFT	23	CL204
VDET	22	CL205
VIDEO 5V	21	CL206
TC ON	20	CL207
L/BG	19	CL209
EVER 5V	18	CL210
AUDIO MUTE	17	CL211
TU VCC	16	CL213
TU BI DET	15	CL214
TU ST DET	14	CL215
FORCED MONO	13	CL216
VH	12	CL217
VL	11	CL218
U	10	CL219
SW 5V	9	CL221
VIDEO	8	CL222
VIDEOGND	7	CL223
AUDIOL	6	
AUDIOR	5	
GND	4	CL224
TIMER REC KEY	3	
RMC IN	2	CL226
TIMER CHECK KEY	1	CL227

TO TU-142 BOARD CN100

(See Page 16)

CN101

LANC	10	
AUDIO L	9	
AUDIO R	8	
VIDEO	7	
UNREG	6	
DETECT	5	
AUDIO GND	4	
VIDEO GND	3	
GND	2	
NC	1	

TO GV-S50E JK-86 BOARD J901

GV-S50E SERVICE MANUAL SCHEMATIC DIAGRAM See Page 92

Q400 LED DRIVE

Q400 DTC114TE

TIMER REC

D400 GL3PR8

S402 PROG. +

S403 ENTER

S404 ◁

S405 ▷

S406 △

S407 ▽

S408 MENU

IC500 SYNC SEP. 1H PLL

IC500 LA7217

X500 500KHz

IC501 MB90075

IC502 PULSE WIDTH STRETCHER

IC502 TC4581F

X501 17.7MHz

IC200 SW REG

IC200 MB3775

IC300 5V REG

IC300 S-81350HG-K8

IC301 EEP ROM

Q500 XP4501 SYNC TIP CLAMP

Q501 2SB1462QR -AMP-

Q502 2SB1462QR BUFFER

Q503 2SB1462QR

Q200 UN9113-TX SWITCH

Q207 UN9213-TX SWITCH

Q201, 202, 204 PWM SWITCHING

Q203, 205 PWM SWITCHING

Q206 PWM SWITCHING

Q200 1SS250

Q201 2SD2216QR

Q202 2SB1462QR

Q203 2SD2216QR

Q204 2SD2216QR

Q205 2SB624

Q206 2SC3035TP

D500 MA3075

D501 MA3075

D502 RB13E

D503 RB13E

D504 MA8047-H

D201 SB05-05CP

L500 O.S.C.

L501 47µH

LN8500

S414 INPUT SEL TUNER LINE

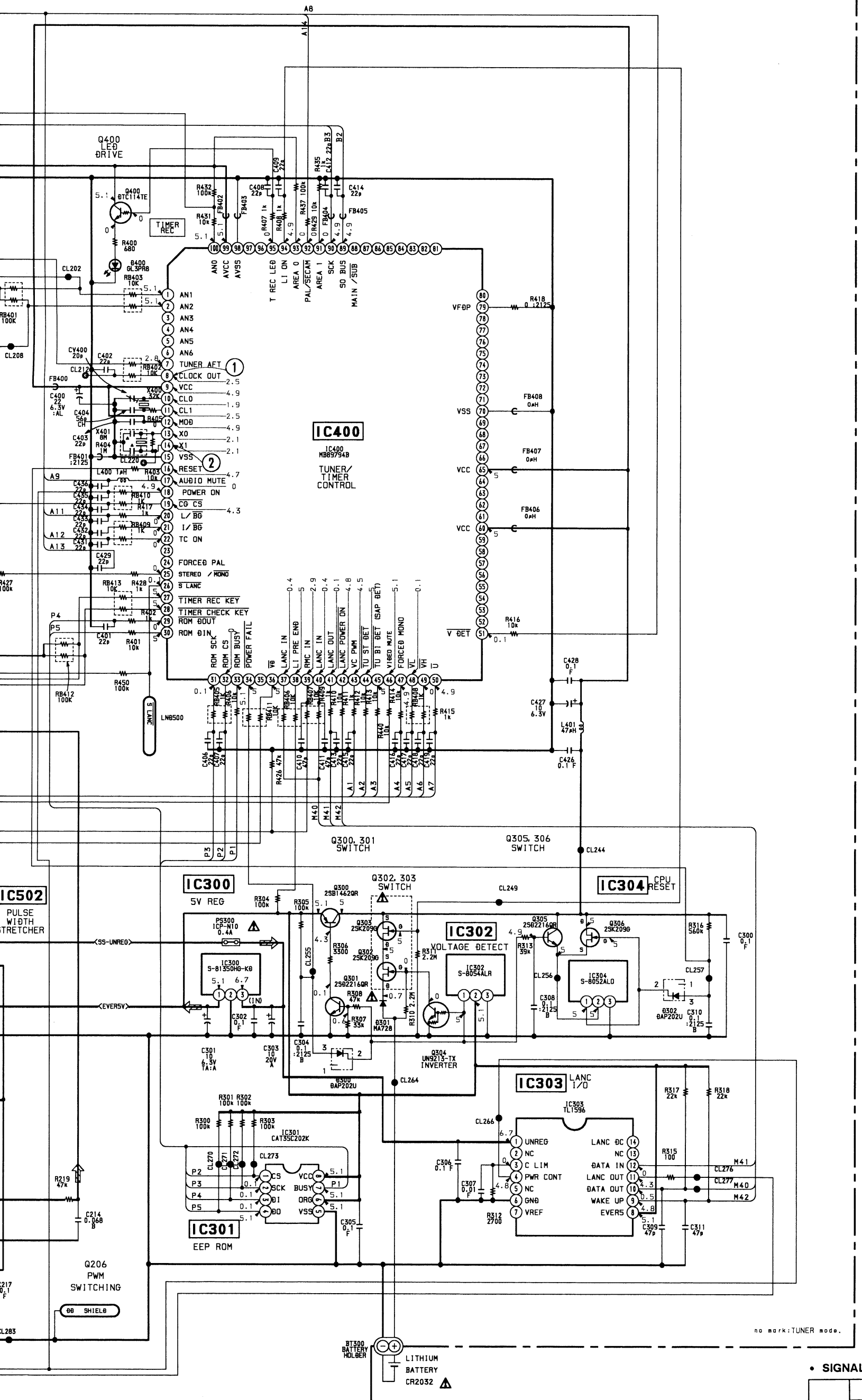
CHR SHIELD

DD SHIELD

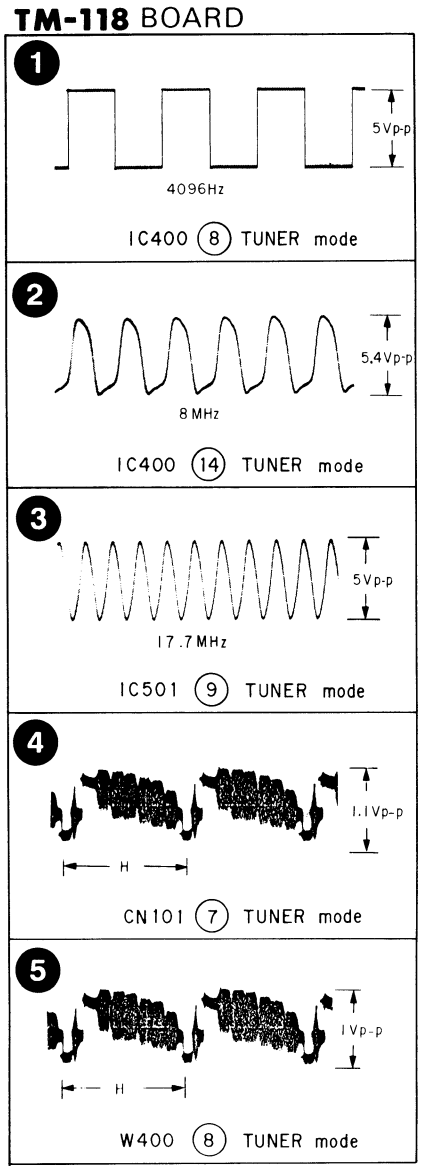
S_LANC

P1 P2 P3 P4 P5

9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20



TM-118 BOARD

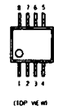


- **SIGNAL PATH**

	VIDEO SIGNAL			AUDIO SIGNAL
	CHROMA	Y	Y/CHROMA	
REC			➡	➡
PB				

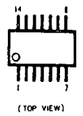
4-2. SEMICONDUCTOR

CAT35C202K

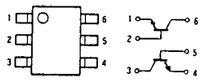


TC4S81F

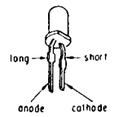
LA7217M
TL1596CDB



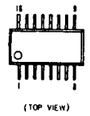
XP4501



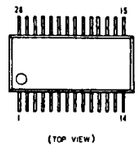
TLUR164



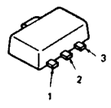
MB3775PFV



MB90075PF



S-8052ALO-LG-S
S-8054ALR-LN-S
S-81350HG-KD

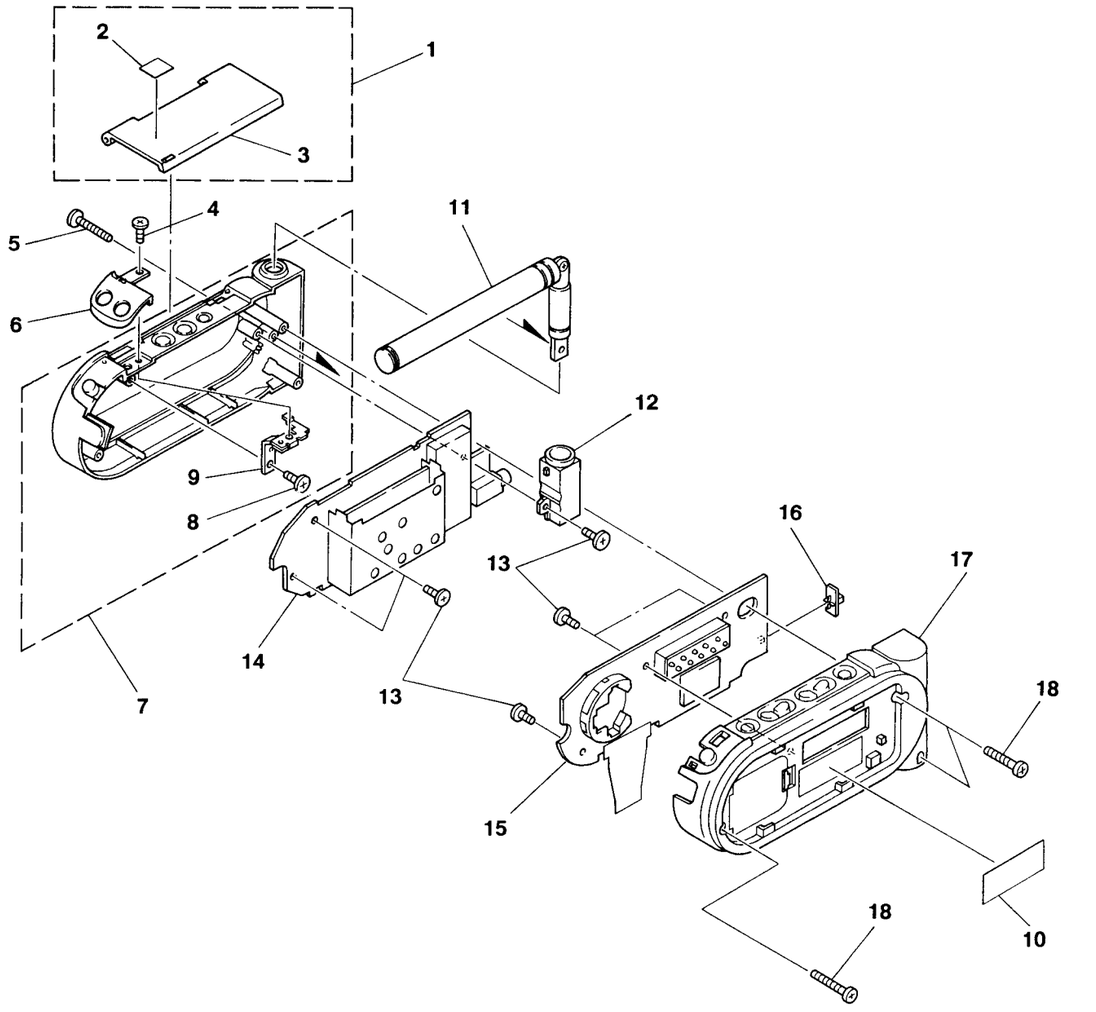


SECTION 5
EXPLODED VIEWS

NOTE:
- -XX, -X mean standardized parts, so they may have some difference from the original one.
- Items marked " * " are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- The mechanical parts with no reference number in the exploded views are not supplied.
- Hardware (# mark) list is given in the last of this parts list.

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

5-1. TUNER/TIMER UNIT ASSEMBLY



Ref. No.	Part No.	Description	Remark
1	X-3942-226-1	DOOR ASSY, BUTTON	
* 2	3-703-713-41	STICKER, SONY SYMBOL (10)	
3	3-949-503-01	DOOR, BUTTON	
4	3-719-381-01	SCREW (M2X4)	
5	3-740-546-01	SCREW (M2X10)	
6	X-3942-049-1	PANEL ASSY, FRONT	
7	X-3942-047-1	CABINET (L) ASSY	
8	3-713-786-21	SCREW (M2X3)	
9	X-3942-163-1	NUT ASSY, PLATE	
* 10	3-949-695-01	LABEL, MODEL NUMBER	
11	1-501-456-11	ANTENNA, TELESCOPIC	
* 12	3-949-513-01	HOLDER, ANTENNA	
13	3-713-790-11	SCREW (M2X5), TAPPING, P3	
14	A-7063-388-A	TU-142 (C) BOARD, COMPLETE	
15	A-7063-387-A	TM-118 (C) BOARD, COMPLETE	
16	3-949-512-01	BUTTON, INPUT SELECTION	
17	X-3942-227-1	CABINET (R) ASSY	
18	3-713-790-31	SCREW (M2X8), TAPPING, P3	

NOTE:
The com
⚠ or do
critical fo
Replace
specified

Ref. No.

*

BT300

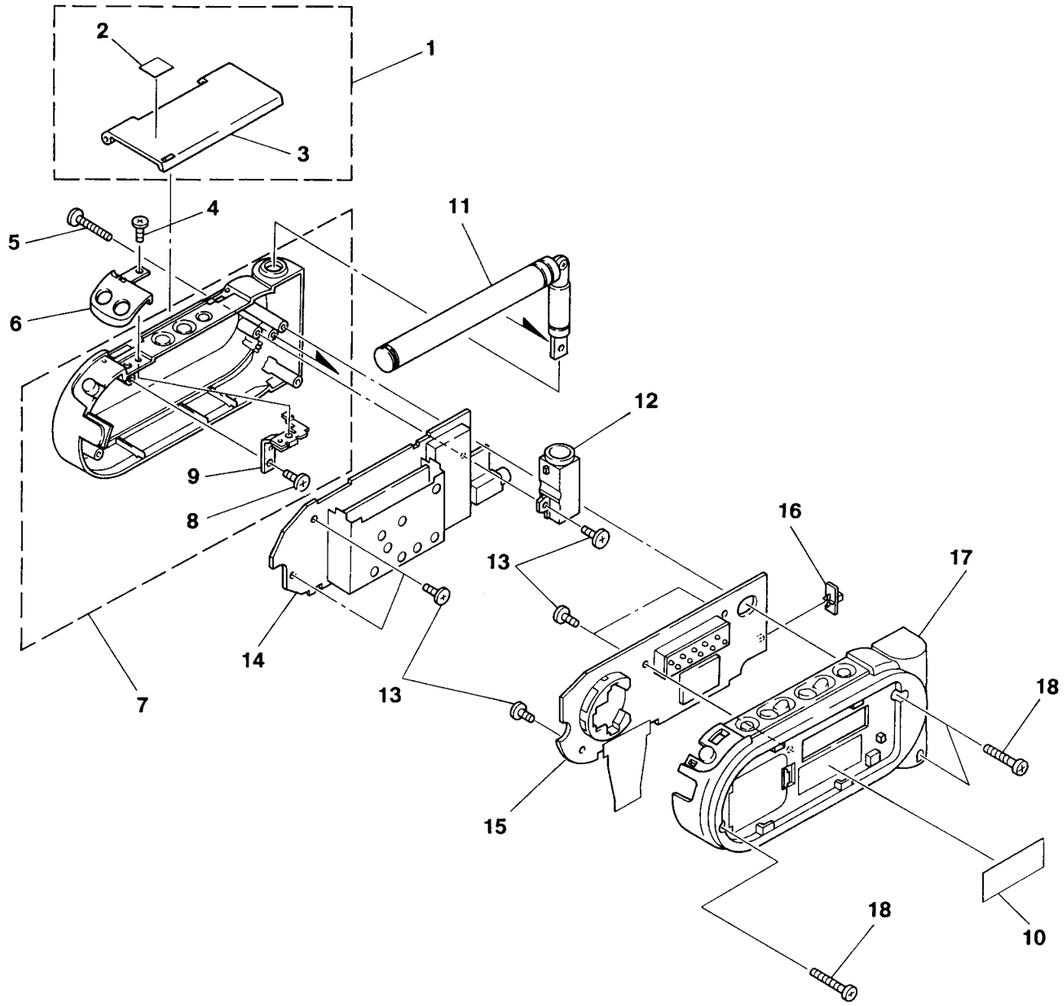
C200
C201
C202
C203
C204
C205
C206
C207
C208
C209
C210
C211
C212
C213
C214
C215
C216
C217
C220
C300
C301
C302
C303
C304
C305
C306
C307
C308
C309
C310
C311
C400
C401
C402
C403
C404

SECTION 5
EXPLODED VIEWS

NOTE:
- -XX, -X mean standardized parts, so they may have some difference from the original one.
- Items marked " * " are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- The mechanical parts with no reference number in the exploded views are not supplied.
- Hardware (# mark) list is given in the last of this parts list.

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

5-1. TUNER/TIMER UNIT ASSEMBLY



Ref. No.	Part No.	Description	Remark
1	X-3942-226-1	DOOR ASSY, BUTTON	
* 2	3-703-713-41	STICKER, SONY SYMBOL (10)	
3	3-949-503-01	DOOR, BUTTON	
4	3-719-381-01	SCREW (M2X4)	
5	3-740-546-01	SCREW (M2X10)	
6	X-3942-049-1	PANEL ASSY, FRONT	
7	X-3942-047-1	CABINET (L) ASSY	
8	3-713-786-21	SCREW (M2X3)	
9	X-3942-163-1	NUT ASSY, PLATE	
* 10	3-949-695-01	LABEL, MODEL NUMBER	
11	1-501-456-11	ANTENNA, TELESCOPIC	
* 12	3-949-513-01	HOLDER, ANTENNA	
13	3-713-790-11	SCREW (M2X5), TAPPING, P3	
14	A-7063-388-A	TU-142 (C) BOARD, COMPLETE	
15	A-7063-387-A	TM-118 (C) BOARD, COMPLETE	
16	3-949-512-01	BUTTON, INPUT SELECTION	
17	X-3942-227-1	CABINET (R) ASSY	
18	3-713-790-31	SCREW (M2X8), TAPPING, P3	

SECTION 6
ELECTRICAL PARTS LIST

NOTE:

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

- Due to standardization, replacements in the parts list may be different from the parts specified in the diagrams or the components used on the set.
- -XX, -X mean standardized parts, so they may have some difference from the original one.
- RESISTORS
  All resistors are in ohms
  METAL: Metal-film resistor
  METAL OXIDE: Metal Oxide-film resistor
  F : nonflammable
- Hardware (# mark) list is given in the last of this parts list.
- Items marked " * " are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- SEMICONDUCTORS
  In each case, u: μ , for example:
  uA...: μA..., uPA...: μPA...,
  uPB...: μPB..., uPC...: μPC...,
  uPD...: μPD...
- CAPACITORS
  uF : μF
- COILS
  uH : μH

Ref. No.	Part No.	Description			Remark
*	A-7063-387-A	TM-118 BOARD, COMPLETE			
		**********			
		〈 HOLDER, BATTERY 〉			
BT300	1-550-414-11	HOLDER, BATTERY			
		〈 CAPACITOR 〉			
C200	1-164-360-11	CERAMIC CHIP 0.1uF		16V	
C201	1-164-360-11	CERAMIC CHIP 0.1uF		16V	
C202	1-164-816-11	CERAMIC CHIP 220PF	2%	50V	
C203	1-164-360-11	CERAMIC CHIP 0.1uF		16V	
C204	1-164-346-11	CERAMIC CHIP 1uF		16V	
C205	1-164-222-11	CERAMIC CHIP 0.22uF		25V	
C206	1-162-964-11	CERAMIC CHIP 0.001uF	10%	50V	
C207	1-162-960-11	CERAMIC CHIP 220PF	10%	50V	
C208	1-162-961-11	CERAMIC CHIP 330PF	10%	50V	
C209	1-135-159-21	TANTALUM CHIP 10uF	10%	20V	
C210	1-162-953-11	CERAMIC CHIP 100PF	5%	50V	
C211	1-135-079-21	TANTALUM CHIP 3.3uF	10%	35V	
C212	1-135-161-21	TANTALUM CHIP 22uF	10%	10V	
C213	1-162-955-11	CERAMIC CHIP 150PF	5%	50V	
C214	1-163-036-00	CERAMIC CHIP 0.068uF		50V	
C215	1-135-159-21	TANTALUM CHIP 10uF	10%	20V	
C216	1-162-964-11	CERAMIC CHIP 0.001uF	10%	50V	
C217	1-164-360-11	CERAMIC CHIP 0.1uF		16V	
C220	1-164-346-11	CERAMIC CHIP 1uF		16V	
C300	1-164-360-11	CERAMIC CHIP 0.1uF		16V	
C301	1-135-259-11	TANTAL. CHIP 10uF	20%	6.3V	
C302	1-164-360-11	CERAMIC CHIP 0.1uF		16V	
C303	1-135-159-21	TANTALUM CHIP 10uF	10%	20V	
C304	1-164-004-11	CERAMIC CHIP 0.1uF	10%	25V	
C305	1-164-360-11	CERAMIC CHIP 0.1uF		16V	
C306	1-164-360-11	CERAMIC CHIP 0.1uF		16V	
C307	1-162-974-11	CERAMIC CHIP 0.01uF		50V	
C308	1-164-004-11	CERAMIC CHIP 0.1uF	10%	25V	
C309	1-162-949-11	CERAMIC CHIP 47PF	5%	50V	
C310	1-164-004-11	CERAMIC CHIP 0.1uF	10%	25V	
C311	1-162-949-11	CERAMIC CHIP 47PF	5%	50V	
C400	1-124-778-00	ELECT CHIP 22uF	20%	6.3V	
C401	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C402	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C403	1-162-919-11	CERAMIC CHIP 22PF	5%	50V	
C404	1-162-924-11	CERAMIC CHIP 56PF	5%	50V	
C406	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C407	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C408	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C409	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C410	1-162-949-11	CERAMIC CHIP 47PF	5%	50V	
C411	1-162-949-11	CERAMIC CHIP 47PF	5%	50V	
C412	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C413	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C414	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C415	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C416	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C417	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C418	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C419	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C426	1-164-360-11	CERAMIC CHIP 0.1uF		16V	
C427	1-135-259-11	TANTAL. CHIP 10uF	20%	6.3V	
C428	1-164-360-11	CERAMIC CHIP 0.1uF		16V	
C429	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C431	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C432	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C433	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C434	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C435	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C436	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C500	1-162-974-11	CERAMIC CHIP 0.01uF		50V	
C501	1-162-974-11	CERAMIC CHIP 0.01uF		50V	
C502	1-164-473-11	CERAMIC CHIP 820PF	5%	50V	
C503	1-135-091-00	TANTALUM CHIP 1uF	20%	16V	
C504	1-135-259-11	TANTAL. CHIP 10uF	20%	6.3V	
C505	1-164-505-11	CERAMIC CHIP 2.2uF		16V	
C506	1-164-227-11	CERAMIC CHIP 0.022uF	10%	25V	
C507	1-164-343-11	CERAMIC CHIP 0.056uF	10%	25V	
C508	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C509	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C510	1-162-945-11	CERAMIC CHIP 22PF	5%	50V	
C513	1-135-259-11	TANTAL. CHIP 10uF	20%	6.3V	
C514	1-135-259-11	TANTAL. CHIP 10uF	20%	6.3V	
C515	1-124-779-00	ELECT CHIP 10uF	20%	16V	
C516	1-162-918-11	CERAMIC CHIP 18PF	5%	50V	
C517	1-162-917-11	CERAMIC CHIP 15PF	5%	50V	
C518	1-126-246-11	ELECT CHIP 220uF	20%	4V	
C519	1-124-779-00	ELECT CHIP 10uF	20%	16V	
C520	1-124-779-00	ELECT CHIP 10uF	20%	16V	
C521	1-124-779-00	ELECT CHIP 10uF	20%	16V	

Ref. No.	Part No.	Description			Remark
C522	1-135-259-11	TANTAL. CHIP 10uF	20%	6.3V	
C530	1-162-926-11	CERAMIC CHIP 82PF	5%	50V	
C999	1-135-161-21	TANTALUM CHIP 22uF	10%	10V	
		〈 CAP, ADJ 〉			
CV400	1-141-423-61	CAP, ADJ			
		〈 DIODE 〉			
D200	8-719-802-36	DIODE 1SS250			
D201	8-719-938-75	DIODE SB05-05CP			
D300	8-719-941-09	DIODE DAP202U			
⚠D301	8-719-421-27	DIODE MA728			
D302	8-719-941-09	DIODE DAP202U			
D400	8-719-800-56	LED TLUR164			
D500	8-719-420-81	DIODE MA3075WA			
D501	8-719-420-81	DIODE MA3075WA			
D502	8-719-106-80	DIODE RD13M-B2			
D503	8-719-106-80	DIODE RD13M-B2			
D504	8-719-106-80	DIODE RD13M-B2			
D510	8-719-420-81	DIODE MA3075WA			
		〈 FERRITE BEAD 〉			
FB400	1-412-390-21	INDUCTOR CHIP 0uH			
FB401	1-412-390-21	INDUCTOR CHIP 0uH			
FB402	1-412-390-21	INDUCTOR CHIP 0uH			
FB403	1-412-390-21	INDUCTOR CHIP 0uH			
FB404	1-412-390-21	INDUCTOR CHIP 0uH			
FB405	1-412-390-21	INDUCTOR CHIP 0uH			
FB406	1-412-390-21	INDUCTOR CHIP 0uH			
FB407	1-412-390-21	INDUCTOR CHIP 0uH			
FB408	1-412-390-21	INDUCTOR CHIP 0uH			
		〈 IC 〉			
IC200	8-759-990-45	IC MB3775PFV			
IC300	8-759-512-69	IC S-81350HG-KD			
IC301	8-759-720-45	IC CAT35C202K			
IC302	8-759-946-03	IC S-8054ALR-LN-S			
IC303	8-759-999-02	IC TL1596CDB			
IC304	8-759-940-33	IC S-8052ALO-LG-S			
IC400	8-759-083-08	IC MB89794BPF-177			
IC500	8-759-083-11	IC LA7217M			
IC501	8-759-083-09	IC MB90075PF			
IC502	8-759-209-97	IC TC4S81F			
		〈 COIL 〉			
L200	1-424-522-21	COIL, CHOKE 10uH			
L201	1-424-522-21	COIL, CHOKE 10uH			
L202	1-408-790-00	INDUCTOR CHIP 120uH			
L203	1-424-524-21	COIL, CHOKE 47uH			
L400	1-412-979-21	INDUCTOR 1uH			
L401	1-412-031-11	INDUCTOR CHIP 47uH			
L500	1-406-452-11	COIL, OSC			
L501	1-412-031-11	INDUCTOR CHIP 47uH			
		〈 LINK, IC 〉			
⚠PS300	1-532-605-00	LINK, IC ICP-N10 (0.4A)			
		〈 TRANSISTOR 〉			
Q200	8-729-428-88	TRANSISTOR UN9113			
Q201	8-729-425-64	TRANSISTOR 2SD2216Q			
Q202	8-729-425-50	TRANSISTOR 2SB1462Q			
Q203	8-729-425-64	TRANSISTOR 2SD2216Q			
Q204	8-729-425-64	TRANSISTOR 2SD2216Q			
Q205	8-729-141-48	TRANSISTOR 2SB624-BV345			
Q206	8-729-601-58	TRANSISTOR 2SC3053-C			
Q207	8-729-429-18	TRANSISTOR UN9213			
Q300	8-729-425-50	TRANSISTOR 2SB1462Q			
Q301	8-729-425-64	TRANSISTOR 2SD2216Q			
⚠Q302	8-729-220-93	TRANSISTOR 2SK209-G			
⚠Q303	8-729-220-93	TRANSISTOR 2SK209-G			
Q304	8-729-429-18	TRANSISTOR UN9213			
Q305	8-729-425-64	TRANSISTOR 2SD2216Q			
Q306	8-729-220-93	TRANSISTOR 2SK209-G			
Q400	8-729-929-26	TRANSISTOR DTC114TE			
Q500	8-729-427-72	TRANSISTOR XP4501			
Q501	8-729-425-64	TRANSISTOR 2SD2216Q			
Q502	8-729-425-50	TRANSISTOR 2SB1462Q			
Q503	8-729-425-50	TRANSISTOR 2SB1462Q			
		〈 RESISTOR 〉			
R200	1-216-839-11	METAL CHIP	33K	5%	1/16W
R201	1-216-839-11	METAL CHIP	33K	5%	1/16W
R202	1-216-831-11	METAL CHIP	6.8K	5%	1/16W
R203	1-216-821-11	METAL CHIP	1K	5%	1/16W
R204	1-216-836-11	METAL CHIP	18K	5%	1/16W
R205	1-216-839-11	METAL CHIP	33K	5%	1/16W
R206	1-216-839-11	METAL CHIP	33K	5%	1/16W
R207	1-216-821-11	METAL CHIP	1K	5%	1/16W
R208	1-216-035-00	METAL CHIP	270	5%	1/10W
R209	1-216-833-11	METAL CHIP	10K	5%	1/16W
R210	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R211	1-218-716-11	METAL CHIP	10K	0.50%	1/16W
R212	1-218-749-11	METAL CHIP	240K	0.50%	1/16W
R213	1-218-698-11	METAL CHIP	1.8K	0.50%	1/16W
R214	1-216-818-11	METAL CHIP	560	5%	1/16W
R215	1-218-708-11	METAL CHIP	4.7K	0.50%	1/16W
R216	1-216-833-11	METAL CHIP	10K	5%	1/16W
R217	1-216-833-11	METAL CHIP	10K	5%	1/16W
R218	1-216-839-11	METAL CHIP	33K	5%	1/16W
R219	1-216-841-11	METAL CHIP	47K	5%	1/16W

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

Ref. No.	Part No.	Description				Remark
R220	1-216-845-11	METAL CHIP	100K	5%	1/16W	
R221	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R300	1-216-845-11	METAL CHIP	100K	5%	1/16W	
R301	1-216-845-11	METAL CHIP	100K	5%	1/16W	
R302	1-216-845-11	METAL CHIP	100K	5%	1/16W	
R303	1-216-845-11	METAL CHIP	100K	5%	1/16W	
R304	1-216-845-11	METAL CHIP	100K	5%	1/16W	
R305	1-216-845-11	METAL CHIP	100K	5%	1/16W	
R306	1-216-827-11	METAL CHIP	3.3K	5%	1/16W	
R307	1-216-839-11	METAL CHIP	33K	5%	1/16W	
R308	1-216-841-11	METAL CHIP	47K	5%	1/16W	
R310	1-216-861-11	METAL CHIP	2.2M	5%	1/16W	
R311	1-216-861-11	METAL CHIP	2.2M	5%	1/16W	
R312	1-216-826-11	METAL CHIP	2.7K	5%	1/16W	
R313	1-216-840-11	METAL CHIP	39K	5%	1/16W	
R315	1-216-809-11	METAL CHIP	100	5%	1/16W	
R316	1-216-854-11	METAL CHIP	560K	5%	1/16W	
R317	1-216-837-11	METAL CHIP	22K	5%	1/16W	
R318	1-216-837-11	METAL CHIP	22K	5%	1/16W	
R400	1-216-819-11	METAL CHIP	680	5%	1/16W	
R401	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R402	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R403	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R404	1-216-857-11	METAL CHIP	1M	5%	1/16W	
R405	1-216-864-11	METAL CHIP	0	5%	1/16W	
R406	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R407	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R408	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R409	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R410	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R411	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R412	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R413	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R414	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R415	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R416	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R417	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R418	1-216-864-11	METAL CHIP	0	5%	1/16W	
R420	1-216-837-11	METAL CHIP	22K	5%	1/16W	
R421	1-216-837-11	METAL CHIP	22K	5%	1/16W	
R422	1-216-839-11	METAL CHIP	33K	5%	1/16W	
R423	1-216-841-11	METAL CHIP	47K	5%	1/16W	
R424	1-216-845-11	METAL CHIP	100K	5%	1/16W	
R425	1-216-846-11	METAL CHIP	120K	5%	1/16W	
R426	1-216-841-11	METAL CHIP	47K	5%	1/16W	
R427	1-216-845-11	METAL CHIP	100K	5%	1/16W	
R428	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R429	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R431	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R432	1-216-845-11	METAL CHIP	100K	5%	1/16W	

Ref. No.	Part No.	Description				Remark
R435	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R437	1-216-845-11	METAL CHIP	100K	5%	1/16W	
R440	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R450	1-216-845-11	METAL CHIP	100K	5%	1/16W	
R500	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R501	1-216-818-11	METAL CHIP	560	5%	1/16W	
R503	1-216-847-11	METAL CHIP	150K	5%	1/16W	
R504	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R505	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R506	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R508	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R509	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R510	1-216-833-11	METAL CHIP	10K	5%	1/16W	
R511	1-216-864-11	METAL CHIP	0	5%	1/16W	
R512	1-216-828-11	METAL CHIP	3.9K	5%	1/16W	
R513	1-216-822-11	METAL CHIP	1.2K	5%	1/16W	
R514	1-216-839-11	METAL CHIP	33K	5%	1/16W	
R515	1-216-809-11	METAL CHIP	100	5%	1/16W	
R516	1-216-835-11	METAL CHIP	15K	5%	1/16W	
R517	1-216-819-11	METAL CHIP	680	5%	1/16W	
R518	1-216-832-11	METAL CHIP	8.2K	5%	1/16W	
R519	1-216-823-11	METAL CHIP	1.5K	5%	1/16W	
R520	1-216-817-11	METAL CHIP	470	5%	1/16W	
R521	1-216-864-11	METAL CHIP	0	5%	1/16W	
R522	1-216-821-11	METAL CHIP	1K	5%	1/16W	
R523	1-216-834-11	METAL CHIP	12K	5%	1/16W	

〈 NETWORK 〉

RB401	1-236-436-11	NETWORK, RES 100K
RB402	1-236-424-11	NETWORK, RES 10K
RB403	1-236-424-11	NETWORK, RES 10K
RB405	1-236-412-11	NETWORK, RES 1.0K
RB406	1-236-424-11	NETWORK, RES 10K
RB407	1-236-424-11	NETWORK, RES 10K
RB408	1-236-412-11	NETWORK, RES 1.0K
RB409	1-236-412-11	NETWORK, RES 1.0K
RB410	1-236-412-11	NETWORK, RES 1.0K
RB411	1-236-424-11	NETWORK, RES 10K
RB412	1-236-436-11	NETWORK, RES 100K
RB413	1-236-424-11	NETWORK, RES 10K

〈 SWITCH 〉

S402	1-692-032-21	SWITCH, TACTILE (HORIZONTAL) (PROG. +)
S403	1-692-032-21	SWITCH, TACTILE (HORIZONTAL) (ENTER)
S404	1-692-032-21	SWITCH, TACTILE (HORIZONTAL) (▷)
S405	1-692-032-21	SWITCH, TACTILE (HORIZONTAL) (◁)
S406	1-692-032-21	SWITCH, TACTILE (HORIZONTAL) (▽)
S407	1-692-032-21	SWITCH, TACTILE (HORIZONTAL) (△)
S408	1-692-032-21	SWITCH, TACTILE (HORIZONTAL) (MENU)
S414	1-570-114-11	SWITCH, SLIDE (INPUT SEL)

Ref. No.	Part No.	Description			Remark
		⟨ FLEXIBLE BOARD ⟩			
W400	1-645-418-11	FP-569 FLEXIBLE BOARD			
		⟨ VIBRATOR ⟩			
X400	1-579-550-11	VIBRATOR, CRYSTAL (32.768kHz)			
X401	1-578-689-21	VIBRATOR (8MHz)			
X500	1-578-690-11	VIBRATOR, CERAMIC (500kHz)			
X501	1-579-780-21	VIBRATOR, CRYSTAL (17.7MHz)			
**********					
*	A-7063-388-A	TU-142 BOARD, COMPLETE **********			
		⟨ CAPACITOR ⟩			
C001	1-162-968-11	CERAMIC CHIP	0.0047uF	10% 50V	
C002	1-162-968-11	CERAMIC CHIP	0.0047uF	10% 50V	
C003	1-128-004-11	ELECT CHIP	10uF	20% 16V	
C004	1-162-968-11	CERAMIC CHIP	0.0047uF	10% 50V	
C005	1-128-007-11	ELECT CHIP	2.2uF	20% 35V	
C007	1-164-156-11	CERAMIC CHIP	0.1uF	25V	
C008	1-162-968-11	CERAMIC CHIP	0.0047uF	10% 50V	
C009	1-164-156-11	CERAMIC CHIP	0.1uF	25V	
C010	1-128-007-11	ELECT CHIP	2.2uF	20% 35V	
C012	1-162-968-11	CERAMIC CHIP	0.0047uF	10% 50V	
C013	1-128-004-11	ELECT CHIP	10uF	20% 16V	
C017	1-162-970-11	CERAMIC CHIP	0.01uF	10% 25V	
C018	1-162-968-11	CERAMIC CHIP	0.0047uF	10% 50V	
C019	1-162-913-11	CERAMIC CHIP	8PF	0.5PF 50V	
C020	1-162-916-11	CERAMIC CHIP	12PF	5% 50V	
C022	1-162-968-11	CERAMIC CHIP	0.0047uF	10% 50V	
C026	1-162-968-11	CERAMIC CHIP	0.0047uF	10% 50V	
C100	1-163-036-00	CERAMIC CHIP	0.068uF	50V	
C101	1-163-036-00	CERAMIC CHIP	0.068uF	50V	
C102	1-163-036-00	CERAMIC CHIP	0.068uF	50V	
C103	1-135-259-11	TANTAL. CHIP	10uF	20% 6.3V	
C104	1-162-921-11	CERAMIC CHIP	33PF	5% 50V	
C109	1-162-968-11	CERAMIC CHIP	0.0047uF	10% 50V	
C110	1-162-968-11	CERAMIC CHIP	0.0047uF	10% 50V	
C111	1-164-361-11	CERAMIC CHIP	0.047uF	16V	
C112	1-135-177-21	TANTALUM CHIP	1uF	20% 20V	
C113	1-163-035-00	CERAMIC CHIP	0.047uF	50V	
C114	1-164-361-11	CERAMIC CHIP	0.047uF	16V	
C115	1-164-361-11	CERAMIC CHIP	0.047uF	16V	
C116	1-164-361-11	CERAMIC CHIP	0.047uF	16V	
C117	1-135-259-11	TANTAL. CHIP	10uF	20% 6.3V	
C118	1-164-361-11	CERAMIC CHIP	0.047uF	16V	
C119	1-128-004-11	ELECT CHIP	10uF	20% 16V	
C120	1-164-156-11	CERAMIC CHIP	0.1uF	25V	
C121	1-164-156-11	CERAMIC CHIP	0.1uF	25V	
C124	1-135-149-21	TANTAL. CHIP	2.2uF	20% 6.3V	
C127	1-164-227-11	CERAMIC CHIP	0.022uF	10% 25V	
C128	1-162-926-11	CERAMIC CHIP	82PF	5% 50V	
C129	1-162-968-11	CERAMIC CHIP	0.0047uF	10% 50V	
C130	1-162-918-11	CERAMIC CHIP	18PF	5% 50V	
C131	1-162-964-11	CERAMIC CHIP	0.001uF	10% 50V	
C132	1-164-227-11	CERAMIC CHIP	0.022uF	10% 25V	
C133	1-135-181-21	TANTALUM CHIP	4.7uF	20% 6.3V	
C135	1-135-259-11	TANTAL. CHIP	10uF	20% 6.3V	
C139	1-162-974-11	CERAMIC CHIP	0.01uF	50V	
C142	1-135-166-21	TANTALUM CHIP	47uF	10% 10V	
C190	1-135-259-11	TANTAL. CHIP	10uF	20% 6.3V	
C192	1-162-974-11	CERAMIC CHIP	0.01uF	50V	
		⟨ FILTER ⟩			
CF001	1-579-784-11	FILTER, CERAMIC TRAP			
CF002	1-577-560-11	FILTER, CERAMIC			
CF003	1-577-561-11	FILTER, CERAMIC			
		⟨ CONNECTOR ⟩			
CN100	1-573-366-21	CONNECTOR, FFC/FPC 26P			
		⟨ DIODE ⟩			
D100	8-719-941-09	DIODE DAP202U			
		⟨ IC ⟩			
IC001	8-759-083-13	IC TDA9802T			
		⟨ JACK ⟩			
J100	1-507-921-00	JACK (EXT ANT)			
		⟨ COIL ⟩			
L001	1-412-933-21	INDUCTOR	0.33uH		
L002	1-412-948-11	INDUCTOR	5.6uH		
L004	1-412-943-11	INDUCTOR	2.2uH		
L101	1-410-389-31	INDUCTOR CHIP	47uH		
L102	1-412-944-11	INDUCTOR	2.7uH		
L104	1-412-031-11	INDUCTOR CHIP	47uH		
L105	1-412-950-11	INDUCTOR	8.2uH		
		⟨ LINK, IC ⟩			
⚠PS100	1-576-123-21	LINK, IC CCP2E20 (0.8A)			
		⟨ TRANSISTOR ⟩			
Q001	8-729-107-33	TRANSISTOR 2SC3545			
Q002	8-729-928-81	TRANSISTOR DTC144EE			
Q004	8-729-928-19	TRANSISTOR 2SA1774R			
Q006	8-729-927-XX	TRANSISTOR 2SC4617R			
Q100	8-729-928-42	TRANSISTOR DTA143EE			

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

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Ref. No.	Part No.	Description			Remark
Q101	8-729-928-42	TRANSISTOR DTA143EE			
Q102	8-729-928-42	TRANSISTOR DTA143EE			
Q103	8-729-425-64	TRANSISTOR 2SD2216Q			
Q105	8-729-425-64	TRANSISTOR 2SD2216Q			
Q106	8-729-425-50	TRANSISTOR 2SB1462Q			
Q107	8-729-425-64	TRANSISTOR 2SD2216Q			
Q108	8-729-425-64	TRANSISTOR 2SD2216Q			
Q109	8-729-425-64	TRANSISTOR 2SD2216Q			
Q111	8-729-425-64	TRANSISTOR 2SD2216Q			
Q150	8-729-928-42	TRANSISTOR DTA143EE			
		⟨ RESISTOR ⟩			
R001	1-216-822-11	METAL CHIP	1.2K	5%	1/16W
R002	1-216-821-11	METAL CHIP	1K	5%	1/16W
R003	1-216-807-11	METAL CHIP	68	5%	1/16W
R004	1-216-819-11	METAL CHIP	680	5%	1/16W
R005	1-216-023-00	METAL CHIP	82	5%	1/10W
R006	1-216-821-11	METAL CHIP	1K	5%	1/16W
R007	1-216-836-11	METAL CHIP	18K	5%	1/16W
R008	1-216-816-11	METAL CHIP	390	5%	1/16W
R009	1-216-836-11	METAL CHIP	18K	5%	1/16W
R010	1-216-815-11	METAL CHIP	330	5%	1/16W
R011	1-216-818-11	METAL CHIP	560	5%	1/16W
R012	1-216-818-11	METAL CHIP	560	5%	1/16W
R013	1-216-818-11	METAL CHIP	560	5%	1/16W
R014	1-218-272-11	METAL CHIP	5.1K	5%	1/16W
R015	1-220-158-91	METAL CHIP	3.6K	5%	1/16W
R016	1-216-843-11	METAL CHIP	68K	5%	1/16W
R017	1-216-837-11	METAL CHIP	22K	5%	1/16W
R018	1-216-821-11	METAL CHIP	1K	5%	1/16W
R019	1-216-864-11	METAL CHIP	0	5%	1/16W
R020	1-216-864-11	METAL CHIP	0	5%	1/16W
R021	1-216-837-11	METAL CHIP	22K	5%	1/16W
R022	1-216-864-11	METAL CHIP	0	5%	1/16W
R100	1-216-837-11	METAL CHIP	22K	5%	1/16W
R101	1-216-837-11	METAL CHIP	22K	5%	1/16W
R102	1-216-825-11	METAL CHIP	2.2K	5%	1/16W
R103	1-216-825-11	METAL CHIP	2.2K	5%	1/16W
R104	1-216-851-11	METAL CHIP	330K	5%	1/16W
R114	1-216-864-11	METAL CHIP	0	5%	1/16W
R115	1-216-864-11	METAL CHIP	0	5%	1/16W
R116	1-216-864-11	METAL CHIP	0	5%	1/16W
R118	1-216-823-11	METAL CHIP	1.5K	5%	1/16W
R119	1-216-823-11	METAL CHIP	1.5K	5%	1/16W
R120	1-216-814-11	METAL CHIP	270	5%	1/16W
R121	1-216-823-11	METAL CHIP	1.5K	5%	1/16W
R123	1-216-857-11	METAL CHIP	1M	5%	1/16W
R124	1-216-821-11	METAL CHIP	1K	5%	1/16W
R125	1-216-828-11	METAL CHIP	3.9K	5%	1/16W
R126	1-216-826-11	METAL CHIP	2.7K	5%	1/16W
R127	1-216-833-11	METAL CHIP	10K	5%	1/16W
R129	1-216-833-11	METAL CHIP	10K	5%	1/16W
R130	1-216-828-11	METAL CHIP	3.9K	5%	1/16W
R132	1-216-833-11	METAL CHIP	10K	5%	1/16W
R133	1-216-833-11	METAL CHIP	10K	5%	1/16W
R134	1-216-828-11	METAL CHIP	3.9K	5%	1/16W
R135	1-216-833-11	METAL CHIP	10K	5%	1/16W
R137	1-216-841-11	METAL CHIP	47K	5%	1/16W
R138	1-216-839-11	METAL CHIP	33K	5%	1/16W
R140	1-216-864-11	METAL CHIP	0	5%	1/16W
R170	1-216-025-00	METAL CHIP	100	5%	1/10W
R171	1-216-025-00	METAL CHIP	100	5%	1/10W
R172	1-216-832-11	METAL CHIP	8.2K	5%	1/16W
R191	1-216-864-11	METAL CHIP	0	5%	1/16W
		⟨ VARIABLE RESISTOR ⟩			
RV001	1-241-479-11	RES, ADJ, CERMET 22K			
RV002	1-241-477-11	RES, ADJ, CERMET 4.7K			
		⟨ SWITCH ⟩			
S100	1-692-032-21	SWITCH, TACTILE (HORIZONTAL) (PROG. -)			
S101	1-692-032-21	SWITCH, TACTILE (HORIZONTAL) (TIMER CLEAR)			
S102	1-692-032-21	SWITCH, TACTILE (HORIZONTAL) (TIMER REC)			
S103	1-692-032-21	SWITCH, TACTILE (HORIZONTAL) (TIMER CHECK)			
		⟨ SWITCH ⟩			
SWF001	1-579-783-11	FILTER, SAW (38.9M)			
		⟨ COIL ⟩			
T001	1-402-788-11	COIL (5KM)			
T002	1-402-789-11	COIL (5KM)			
		⟨ TUNER ⟩			
⚠TU001	1-693-194-11	TUNER, ET (BT-HG301)			

****

MISCELLANEOUS

****

11	1-501-456-11	ANTENNA, TELESCOPIC

****

ACCESSORIES & PACKING MATERIALS

****

	1-417-176-11	DISTRIBUTOR, ANTENNA
⚠	1-528-174-31	BATTERY, LITHIUM (CR2032 TYPE)
	1-574-517-11	CORD, CONNECTION
	3-755-628-11	MANUAL, INSTRUCTION (ENGLISH)

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

Ref. No.	Part No.	Description	Remark
	3-755-628-41	MANUAL, INSTRUCTION (FRENCH, GERMAN, SPANISH) (AEP)	
	3-755-628-51	MANUAL, INSTRUCTION (DUTCH, SWEDISH, ITALIAN) (AEP)	
*	3-949-520-11	INDIVIDUAL CARTON	
*	3-949-521-02	CUSHION, TUNER	

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

SECTION 7
ELECTRICAL ADJUSTMENTS

Use the following measuring equipments in electrical adjustments.

[Equipments Used]

1) TV Monitor
2) Oscilloscope 2 phenomena, band 30 MHz or wider, with delay mode (Use 10:1 probe unless specified otherwise.)
3) Frequency counter
4) Pattern generator
5) Digital voltmeter
6) Regulated power supply
7) Video cassette recorder (GV-S50E)

[Connecting the Equipments]

Connect the video cassette recorder (GV-S50E) and adjust, unless specified otherwise.

Position of Tuner Timer Unit (TGV-3E) Switch

- Input/output selection switch ····· TV position

1. Clock adjustment (TM-118 board)

Measurement Point	Pin ⑧ of IC400
Measuring Instrument	Frequency counter
Adjusting Element	CV400
Specified Value	4096.086 ± 0.015 Hz

Adjusting Method:

1) Adjust the clock frequency to the specified value with CV400.

2. RF AGC adjustment (TU-142 board)

Measurement Point	TV broadcasting signal
Measuring Instrument	Connect the TV monitor and check
Adjusting Element	
Specified Value	RV001

Adjusting Method:

1) Adjust the contrast of the TV monitor to maximum.
2) Rotate RV001 until the snow noise appears.
3) Rotate it in the opposite direction until the snow noise disappears.
4) Receive each channel and check that there is no beat or image distortion by cross modulations, nor snow noise.

3. VIF phase adjustment (TU-142 board)

Measurement Point	RF signal (pulse and bar)
Measuring Instrument	Pin ⑦ of CN101 on TM-118 board
Adjusting Element	Oscilloscope
Specified Value	RV002

Adjusting Method:

1) Adjust RV002 so that the falling edge of the waveform is almost a right angle.

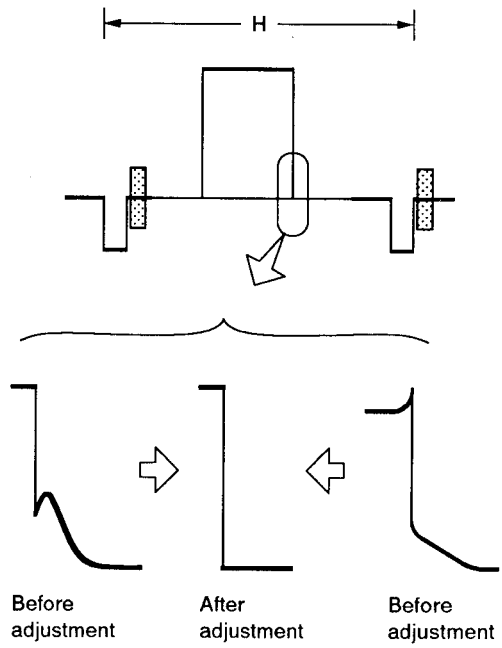
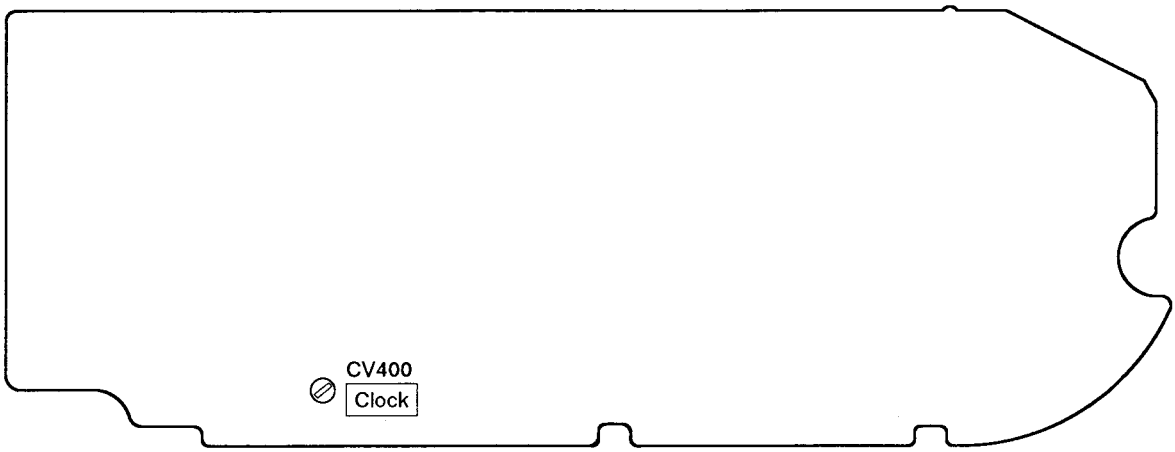


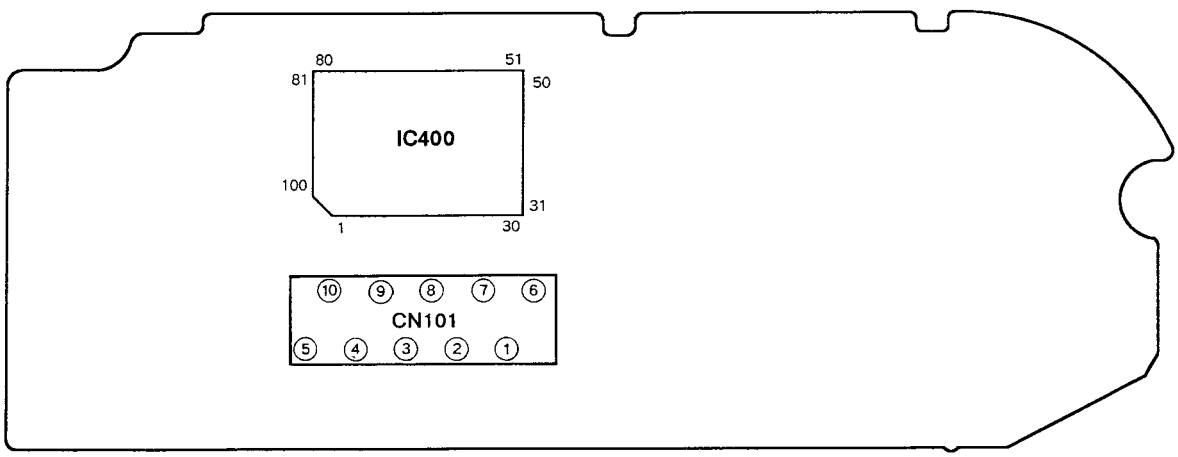
Fig. 7-1.

7-1. ARRANGEMENT DIAGRAM FOR ADJUSTMENT PARTS

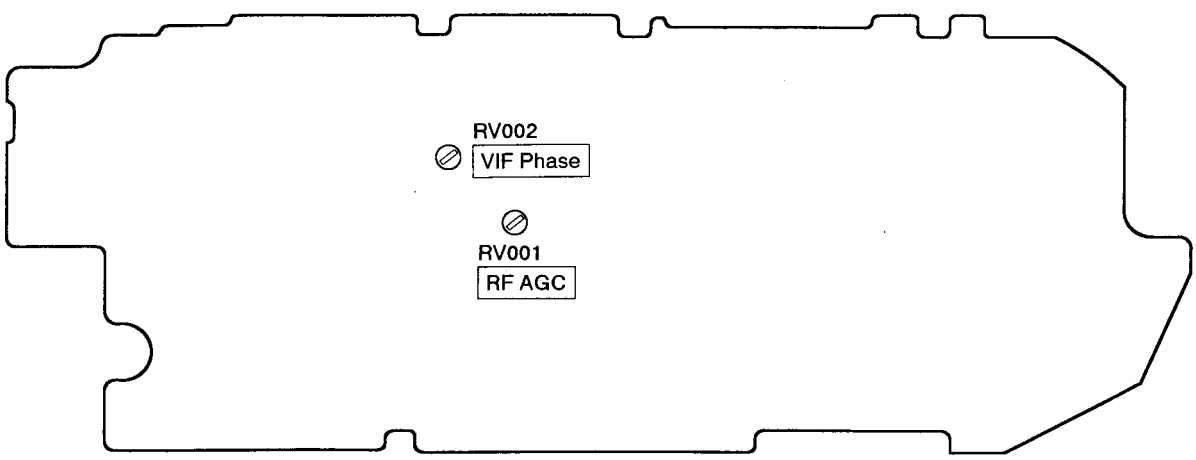
TM-118 BOARD (COMPONENT SIDE)



TM-118 BOARD (CONDUCTOR SIDE)



TU-142 BOARD (COMPONENT SIDE)



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Personal Video Group

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